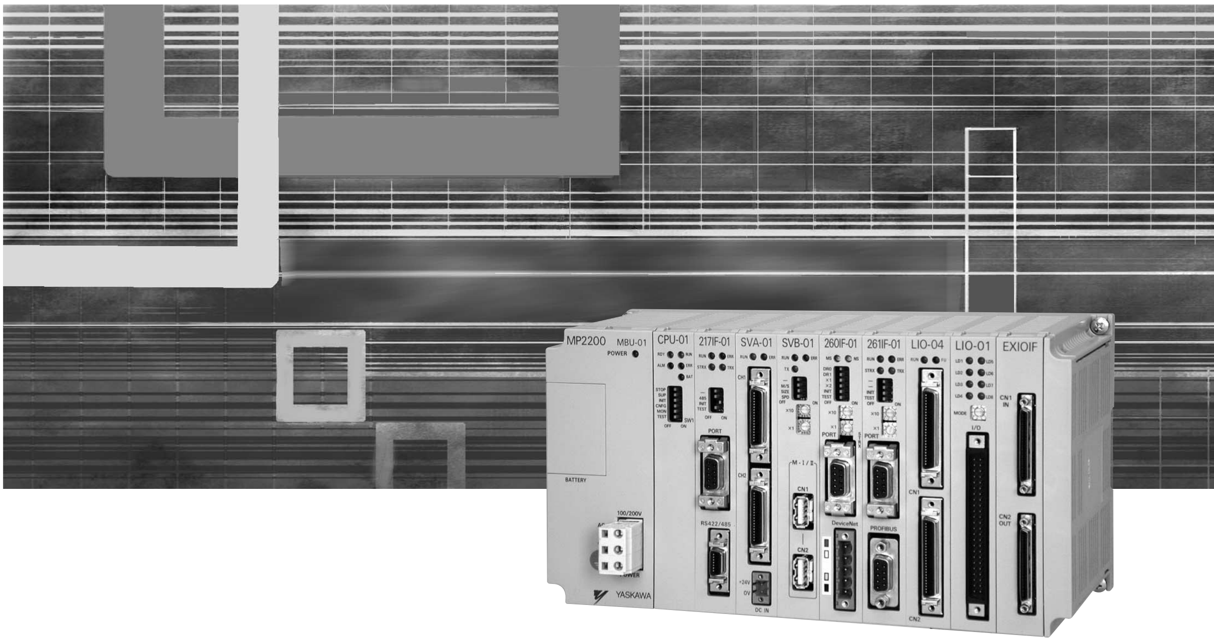
Machine Controller MP2200

USER'S MANUAL



YASKAWA

MANUAL NO. SIEP C880700 14B

Using this Manual

Please read this manual to ensure correct usage of the MP2200 system. Keep this manual in a safe place for future reference.

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MP2200: Machine Controller MP2200
- MPE720: The Programming Device Software or a Programming Device (i.e., a personal computer) running the Programming Device Software
- PC: Programmable Logic Controller

■ Manual Configuration

Read the chapters of this manual as required by the purpose.

Chapter	Selecting Models and Peripheral Devices	Studying Specifications and Ratings	Designing the System	Installation and Wiring	Trial Operation	Maintenance and Inspection
Chapter 1 Overview of the MP2200	Applicable	–	–	–	–	–
Chapter 2 System Configuration	Applicable	–	–	–	–	–
Chapter 3 System Startup	–	–	–	–	Applicable	–
Chapter 4 Module Specifications	Applicable	Applicable	Applicable	Applicable	–	–
Chapter 5 Mounting and Wiring	–	Applicable	Applicable	Applicable	–	–
Chapter 6 Basic System Operation	–	–	Applicable	–	Applicable	–
Chapter 7 Maintenance and Inspection	–	–	–	–	–	Applicable
Chapter 8 Troubleshooting	–	–	–	–	Applicable	Applicable

■ Visual Aids

The following aids are used to indicate certain types of information for easier reference.

IMPORTANT	Indicates important information that should be memorized.
INFO	Indicates supplemental information.
◀ EXAMPLE ▶	Indicates application examples.
TERMS	Describes technical terms that are difficult to understand, or appear in the text without an explanation being given.

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following example:

- $\overline{\text{S-ON}}$ = /S-ON
- $\overline{\text{P-CON}}$ = /P-CON

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- Ethernet is a registered trademark of the Xerox Corporation.
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■ Related Manuals

Refer to the following related manuals as required.

Thoroughly check the specifications, restrictions, and other conditions of the product before attempting to use it.

Manual Name	Manual Number	Contents
Machine Controller MP2200/MP2300 Motion Module User’s Manual	SIEPC88070016	Describes functions, specifications, and how to use the MP2200/MP2300 Motion Modules (SVB-01, SVA-01, SVR).
Machine Controller MP2300 Communication Module User’s Manual	SIEPC88070004	Describes the functions, specifications, and application methods of the MP2200 Communication Modules (217IF, 218IF, 260IF, 261IF).
Machine Controller MP900 Series User’s Manual MECHATROLINK System	SIEZ-C887-5.1	Describes the communication functions, specifications, and application methods of the MECHATORLINK Modules for MP900 Machine Controllers.
Machine Controller MP900 Series User's Manual Ladder Programming	SIEZ-C887-1.2	Describes the instructions used in MP900/MP2000 ladder programming.
Machine Controller MP□□ User's Manual Motion Programming	SIEZ-C887-1.3	Describes the instructions used in MP900/MP2000 motion programming.
Machine Controller MP900/MP2000 Series User’s Manual MPE720 Software for Programming Device	SIEPC88070005	Describes how to install and operate the MP900/MP2000 Series programming system (MPE720).
Machine Controller MP900 Series New Ladder Editor Programming Manual	SIE-C887-13.1	Describes the programming instructions of the New Ladder Editor, which assists MP900/MP2000 Series design and maintenance.
Machine Controller MP900 Series New Ladder Editor User’s Manual	SIE-C887-13.2	Describes the operating methods of the New Ladder Editor, which assists MP900/MP2000 Series design and maintenance.

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ WARNING — Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.

⚠ CAUTION — Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

In some situations, the precautions indicated could have serious consequences if not heeded.

PROHIBITED — Indicates prohibited actions that must not be performed. For example, this symbol would be used as follows to indicate that fire is prohibited: .

MANDATORY — Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory: .

Safety Precautions

The following precautions are for checking products on delivery, storage, transportation, installation, wiring, operation, maintenance, inspection, and disposal. These precautions are important and must be observed.

WARNING

- Before starting operation in combination with the machine, ensure that an emergency stop procedure has been provided and is working correctly.

  There is a risk of injury.
- Do not touch anything inside the MP2200.

  There is a risk of electrical shock.
- Always keep the front cover attached when power is being supplied.

  There is a risk of electrical shock.
- Observe all procedures and precautions given in this manual for trial operation.

  Operating mistakes while the servomotor and machine are connected can cause damage to the machine or even accidents resulting in injury or death.
- Do not remove the front cover, cables, connector, or options while power is being supplied.

  There is a risk of electrical shock.
- Do not allow installation, disassembly, or repairs to be performed by anyone other than specified personnel.

  There is a risk of electrical shock or injury.
- Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch cables.

  There is a risk of electrical shock, operational failure or burning of the MP2200.
- Do not attempt to modify the MP2200 in any way.

  There is a risk of injury or device damage.
- Do not approach the machine when there is a momentary interruption to the power supply. When power is restored, the machine may start operation suddenly. Provide suitable safety measures to protect people when operation restarts.

  There is a risk of injury.

■ Storage and Transportation

⚠ CAUTION
• Do not store or install the MP2200 in the following locations. There is a risk of fire, electrical shock, or device damage. • Direct sunlight • Ambient temperature exceeds the storage or operating conditions • Ambient humidity exceeds the storage or operating conditions • Rapid changes in temperature or locations subject to condensation • Corrosive or flammable gas • Excessive dust, dirt, salt, or metallic powder • Water, oil, or chemicals • Vibration or shock • Do not overload the MP2200 during transportation. There is a risk of injury or an accident.

■ Installation

⚠ CAUTION
• Never use the MP2200 in locations subject to water, corrosive atmospheres, or flammable gas, or near burnable objects. There is a risk of electrical shock or fire. • Do not step on the MP2200 or place heavy objects on the MP2200. There is a risk of injury. • Do not block the air exhaust port or allow foreign objects to enter the MP2200. There is a risk of element deterioration inside, an accident, or fire. • Always mount the MP2200 in the specified orientation. There is a risk of an accident. • Do not subject the MP2200 to strong shock. There is a risk of an accident.

■ Wiring

⚠ CAUTION

- Check the wiring to be sure it has been performed correctly.

  There is a risk of motor run-away, injury, or an accident.
- Always use a power supply of the specified voltage.

  There is a risk of burning.
- In places with poor power supply conditions, take all steps necessary to ensure that the input power supply is within the specified voltage range.

  There is a risk of device damage.
- Install breakers and other safety measure to provide protection against shorts in external wiring.

  There is a risk of fire.
- Provide sufficient shielding when using the MP2200 in the following locations.

  There is a risk of device damage.
  - Noise, such as from static electricity
  - Strong electromagnetic or magnetic fields
  - Radiation
  - Near to power lines
- When connecting the battery, connect the polarity correctly.

  There is a risk of battery damage or explosion.

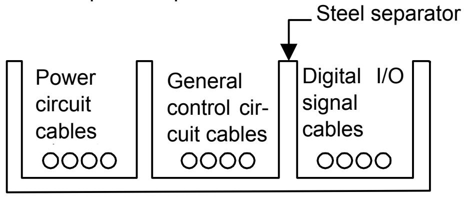
■ Selecting, Separating, and Laying External Cables

⚠ CAUTION

- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP2200 to external devices.
  - Mechanical strength
  - Noise interference
  - Wiring distance
  - Signal voltage, etc.
- Separate the I/O signal lines from the power lines both inside and outside the control box to reduce the influence of noise from the power lines.

  If the I/O signal lines and power lines are not separated properly, malfunctioning may result.

Example of Separated External Cables



■ Maintenance and Inspection Precautions

⚠ CAUTION
• Do not attempt to disassemble the MP2200. There is a risk of electrical shock or injury. • Do not change wiring while power is being supplied. There is a risk of electrical shock or injury. • When replacing the MP2200, restart operation only after transferring the programs and parameters from the old Module to the new Module. There is a risk of device damage.

■ Disposal Precautions

⚠ CAUTION
• Dispose of the MP2200 as general industrial waste.

CONTENTS

1

Outline of MP2200

This chapter provides an overview and describes the features of the MP2200 Machine Controller.

1.1 Features

The MP2200 is a high-performance, multi-axis Machine Controller for flexible system construction. In addition to I/O and Communication Modules, it has a wide range of Optional Modules, including various Motion Modules that support a variety of motor drives. It provides ideal motion control for a range of machines, from standalone machines to FA systems.

(1) Flexibility

- With an option slot configuration that enables expansion to 35 slots, Optional Modules can be selected freely and the optimum system can be built for your machine.

(2) High Performance

- Control characteristics have been improved by increasing the CPU and Motion Network (MECHATROLINK-II) speed.
  - Completely synchronous operation can be achieved for up to 256 axes.
  - MECHATROLINK-II baud rate: 2.5 times faster than MP920
  - CPU processing speed: 2.0 times faster than MP920
  - Larger user memory area
- High-speed (0.5 ms) motion control is now possible.
- MECHATROLINK-II enables position control, speed control, torque control, and phase control, and makes precise synchronous control possible. The control mode can also be changed online, facilitating complicated machine operations. The range of possible motion control applications is increased even further with the Virtual Motion Module (SVR).
- The following open networks are supported when optional Communication Modules are used.
  - Ethernet
  - DeviceNet
  - PROFIBUS

(3) Easy to Use

- Machine startup times can be greatly reduced by using the self-configuration function that automatically detects devices connected to MECHATROLINK and sets the required parameters.
- The application program converter can utilize your previous software assets with their accumulated databanks of specific knowledge to improve the system further.

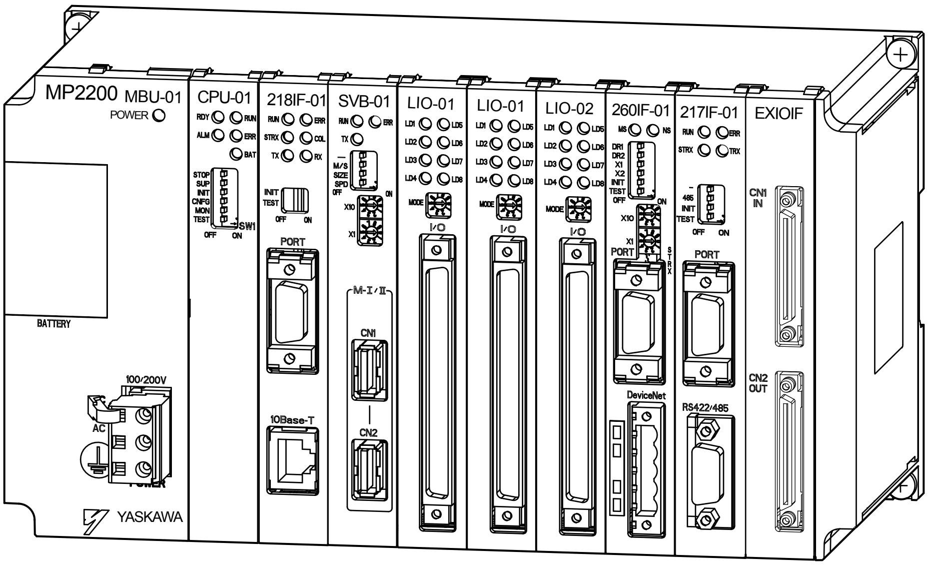
(4) Compact

- The mounting area has been reduced to half that of the MP920.

1.2 Module Appearance

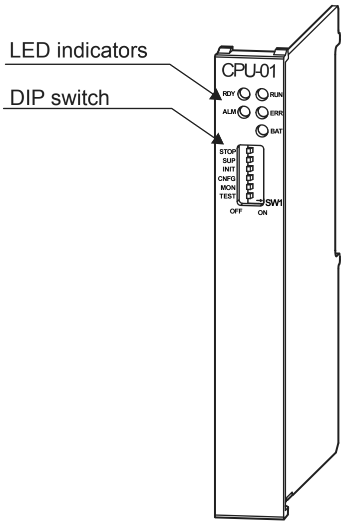
1.2.1 Basic Unit

The following figure shows the external appearance of a Basic Unit.

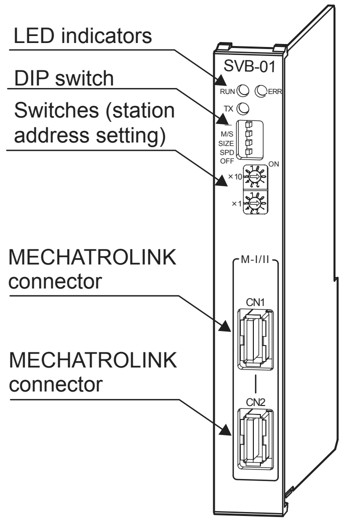


1.2.2 Modules

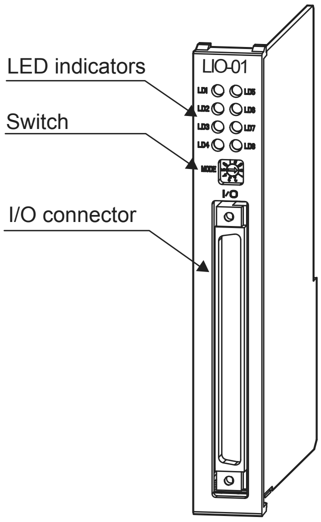
The following figures show the external appearance of the Modules.



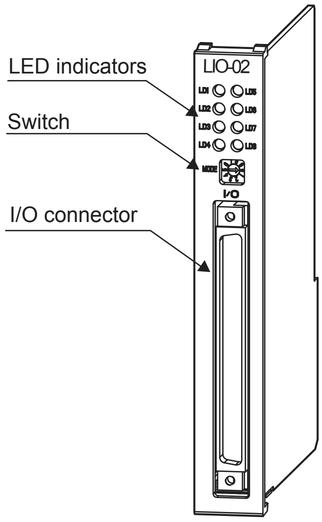
CPU-01



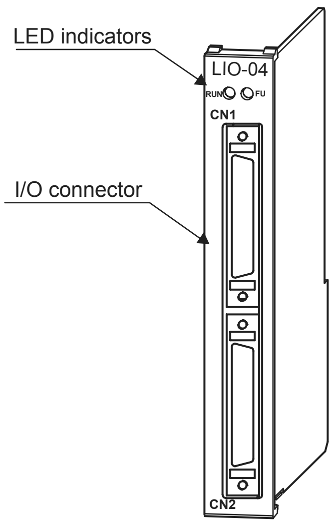
SVB-01



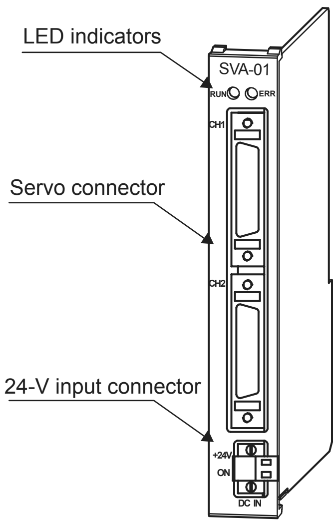
LIO-01



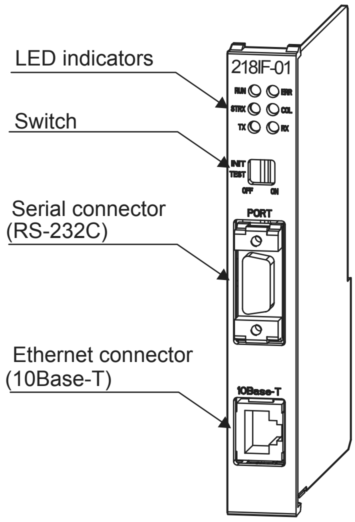
LIO-02



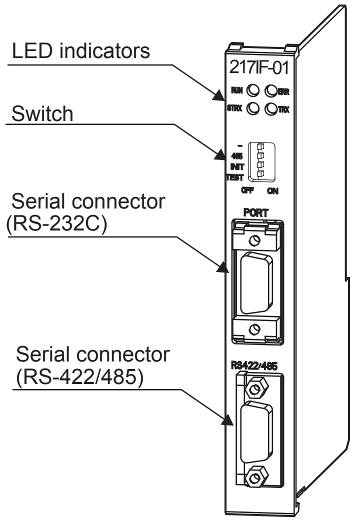
LIO-04



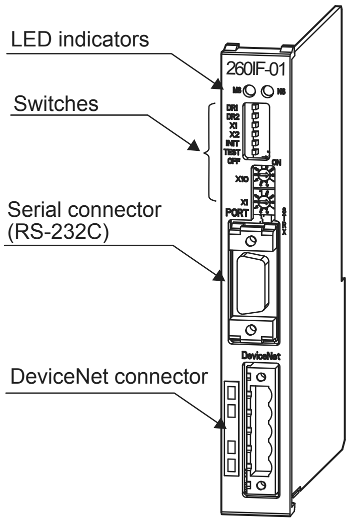
SVA-01



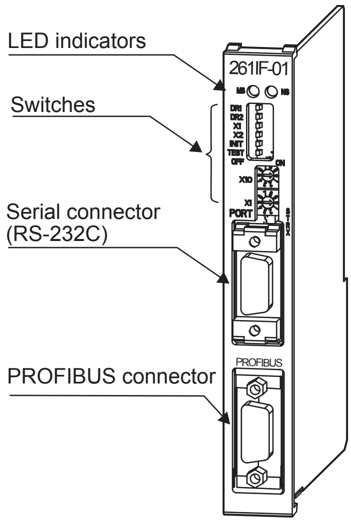
218IF-01



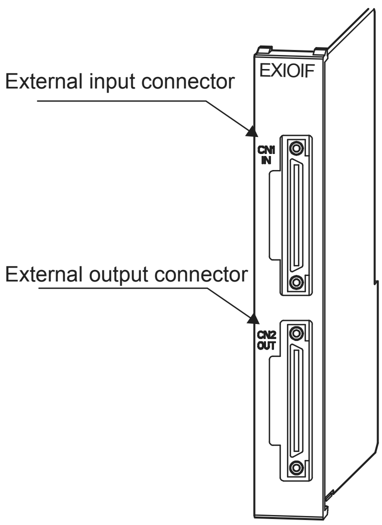
217IF-01



260IF-01



261IF-01



EXIOIF

2

System Configuration

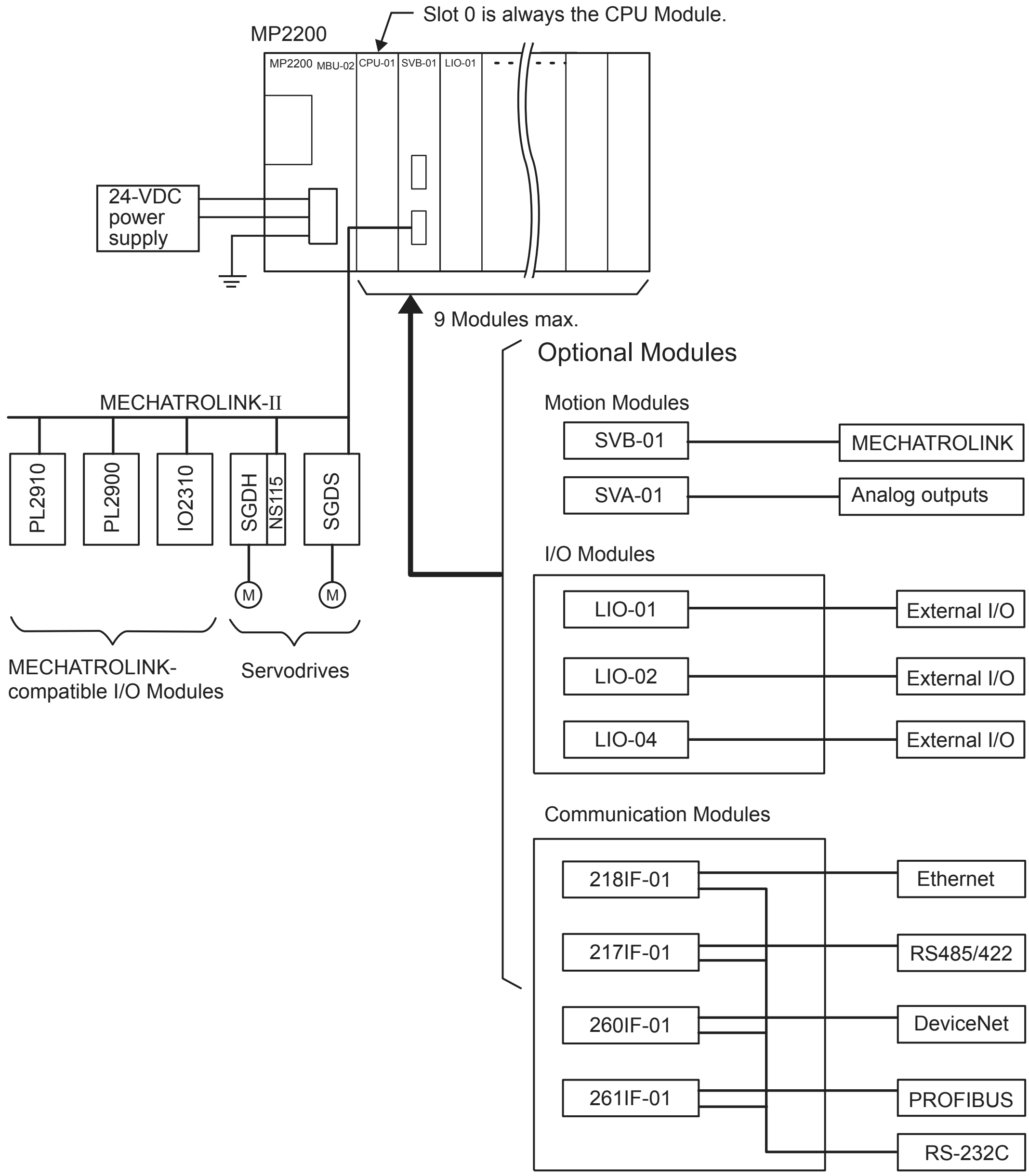
This chapter explains the product information required to build MP2200 systems.

2.1 System Configuration

2.1.1 Basic System Configuration

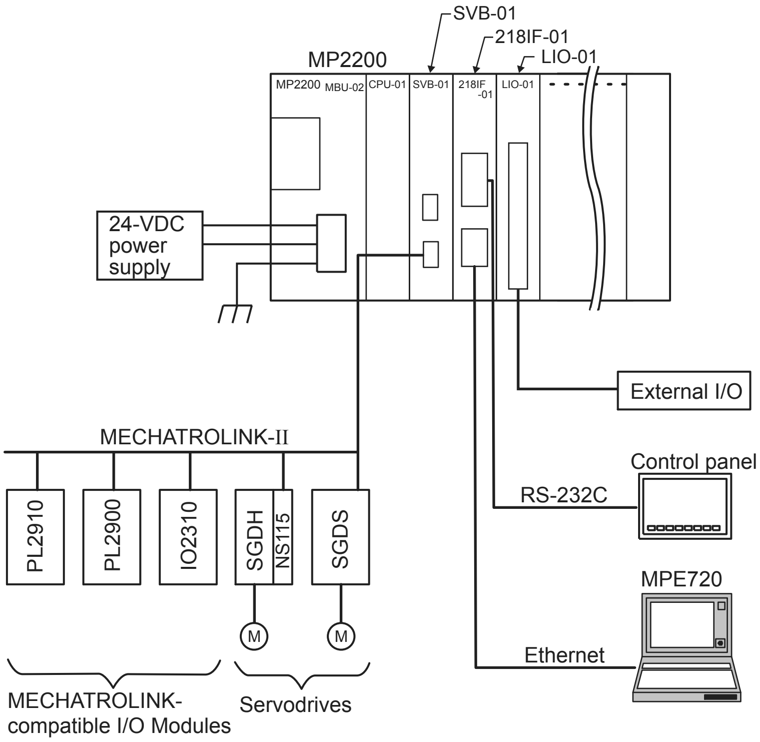
The following diagram shows the basic system configuration.

(1) One-Rack Configuration



◀ EXAMPLE ▶

The following diagram shows an example system configuration.



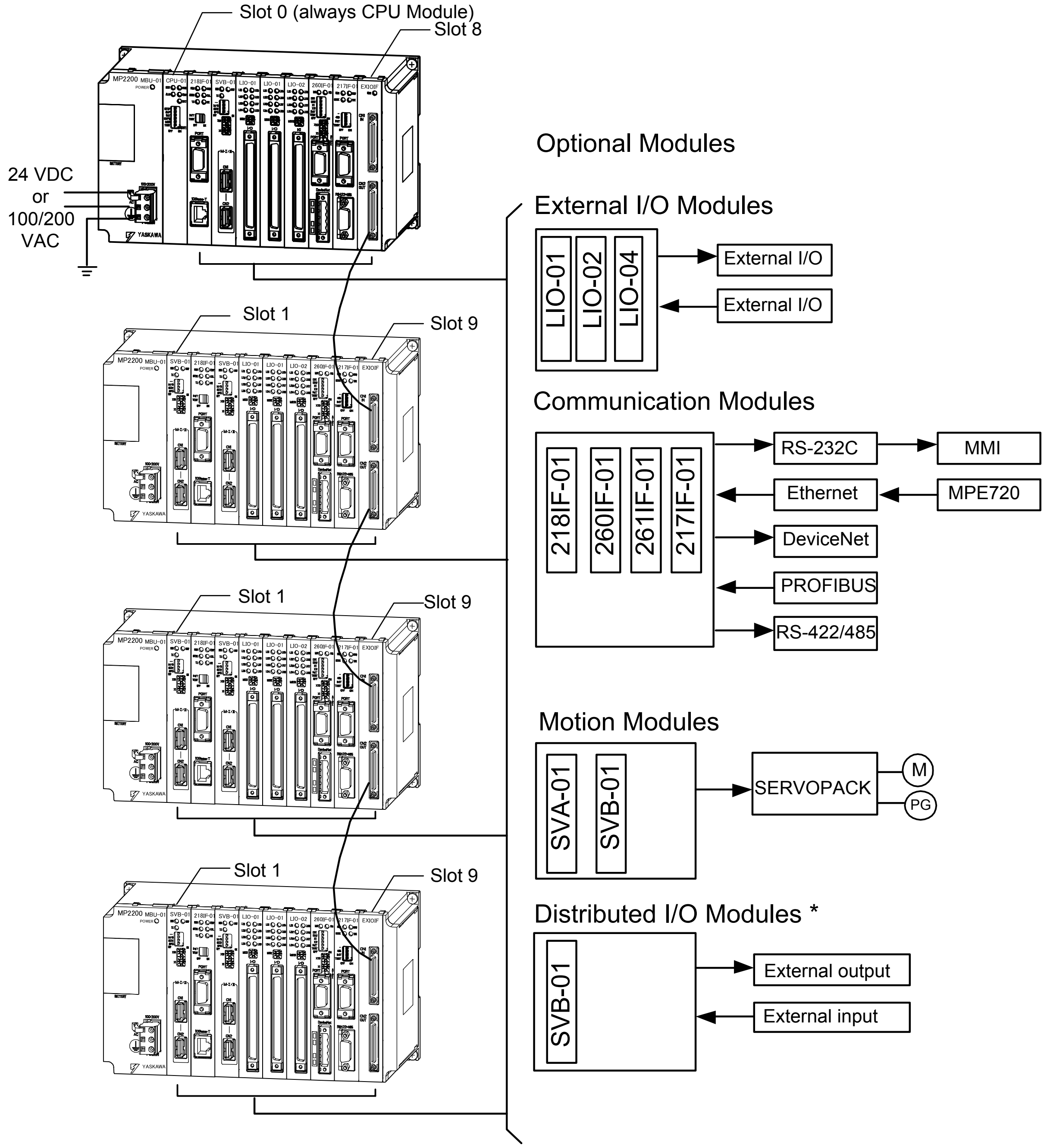
Note: 1. Up to 21 devices can be connected to MECHATROLINK-II. (The SERVOPACKs can be connected to up to 16 axes.)

2. Up to 32 I/O can be used (16 inputs and 16 outputs) with the LIO-01.

3. Communication Modules can be used to connect to Ethernet, DeviceNet, PROFIBUS, RS-232C, and RS-422/485 open networks.

4. In the above example, a 218IF-01 Module is used. The MPE720 is connected to Ethernet and a Human-Machine Interface (HMI) is connected to RS-232C.

(2) Maximum Four-Rack Configuration



* A distributed I/O function is provided by the SVB-01 Modules through MECHATROLINK communication.

2.1.2 System Configuration Precautions

The following precautions must be followed when designing a system using the MP2200.

- Use the connecting cables and connectors recommended by Yaskawa. Yaskawa has a range of cables. Always check the device to be used and select the correct cable for the device.
- Different SERVOPACKs are connected to MECHATROLINK-I and MECHATROLINK-II. Refer to the list and select the appropriate SERVOPACKs.
- The user must supply the 24-VDC power supply.
- The battery backs up M registers, system registers, and trace memory. Always save the program to flash memory whenever it is input or changed.

2.2 List of Modules

2.2.1 MP2200 Modules

The following table shows the Modules that make up MP2200 systems.

Group		Type	Descrip-tion	Model	Occu-pied slots	Overview
Basic Unit	Base Units	Base Unit (for AC power supply)	MBU-01	JEPMC-BU2200	–	Basic Unit with 85- to 276-VAC power supply (9 slots)
		Base Unit (for DC power supply)	MBU-02	JEPMC-BU2210	–	Basic Unit with 24-VDC (±20%) power supply (9 slots)
	CPU Modules	CPU Module	CPU-01	JAPMC-CP2200	1	MP2200 system CPU
Optional Modules	Motion Modules	MECHATROLINK Interface Servo Module	SVB-01	JAPMC-MC2310	1	MECHATROLINK-I and MECHATROLINK-II-compatible SERVOPACKs (16 axes max.)
		Analog Servo Interface Module	SVA-01	JAPMC-MC2300	1	Analog servo interface (2 axes)
	I/O Modules	I/O Module	LIO-01	JAPMC-IO2300	1	16 inputs and 16 outputs (sink mode outputs) 1 pulse input
		I/O Module	LIO-02	JAPMC-IO2301	1	16 inputs and 16 outputs (source mode outputs) 1 pulse input
		I/O Modules	LIO-04	JAPMC-IO2303	1	32 inputs and 32 outputs (sink mode outputs)
	Communication Modules	Ethernet Communication Module	218IF-01	JAPMC-CM2300	1	RS-232C/Ethernet communication
		General-purpose Serial Communication Module	217IF-01	JAPMC-CM2310	1	RS-232C, RS-422, and RS-485 communication
		DeviceNet Communication Module	260IF-01	JAPMC-IO2320	1	RS-232C and DeviceNet communication
		PROFIBUS Communication Module	261IF-01	JAPMC-IO2330	1	RS-232C and PROFIBUS communication
	Expansion Interface Modules	Connection Interface	EXIOIF	JAPMC-EX2200	1	System bus expansion (maximum 4-Rack configuration)

2.3 Devices Connectable to MECHATROLINK

The devices that are compatible with MECHATROLINK and can be connected to the SVB-01 Module are listed below.

(1) SERVOPACKs

The following table shows SERVOPACKs that are compatible with MECHATROLINK and can be connected to the SVB-01 Module.

Model	Details	MECHATROLINK-I	MECHATROLINK-II
SGD-□□□N SGDB-□□AN	MECHATROLINK-I compatible AC SERVOPACKs	○	×
SGDH-□□□E JUSP-NS100	Σ-II Series SGDH Servodrives NS100 MECHATROLINK-I Interface Unit	○	×
SGDH-□□□E JUSP-NS115	Σ-II Series SGDH Servodrives NS115 MECHATROLINK-II Interface Unit	○	○
SGDS-□□□1□□	Σ-III Series AC Servodrives	○	○

(2) I/O Modules

The following table shows Modules that are compatible with MECHATROLINK and can be connected to the SVB-01 Module.

Model	Details	MECHATROLINK-I	MECHATROLINK-II
JEPMC-IO350	64-point I/O Module 24 VDC, 64 inputs, 64 outputs	○	×
JAMSC-120DDI34330	DC Input Module 12/24 VDC, 16 inputs	○	×
JAMSC-120DDO34340	DC Output Module 12/24 VDC, 16 outputs	○	×
JAMSC-120DAI53330	AC Input Module 100 VAC, 8 inputs	○	×
JAMSC-120DAI73330	AC Input Module 200 VAC, 8 inputs	○	×
JAMSC-120DAO83330	AC Output Module 100/200 VAC, 8 outputs	○	×
JAMSC-120DRA83030	Relay Module Wide voltage range relay contacts, 8 outputs	○	×
JAMSC-120AVI02030	A/D Module Analog inputs, −10 to 10 V, 4 channels	○	×
JAMSC-120AVO01030	D/A Module Analog outputs, −10 to 10 V, 2 channels	○	×
JAMSC-120EHC21140	Counter Module Reversible counter, 2 channels	○	×
JAMSC-120MMB20230	Pulse Output Module Pulse output, 2 channels	○	×
JEPMC-IO2310	64-point I/O Module 24 VDC, 64 inputs, 64 outputs	○	○
JEPMC-PL2900	Counter Module Reversible counter, 2 channels	○	○
JEPMC-PL2910	Pulse Output Module Pulse output, 2 channels	○	○
JEPMC-AN2900	A/D Module Analog inputs, −10 to 10 V, 4 channels	○	○
JEPMC-AN2910	D/A Module Analog outputs, −10 to 10 V, 2 channels	○	○
JAPMC-MC2310	SVB-01 Motion Module	○	○
JEVSA-YV250	MYVIS YV250 Machine Vision System	○	○
JEPMC-MC400	MP940 Motion Controller	○	×

2.4 Cables and Accessories

2.4.1 Cables

The following table shows the cables that can be connected to the MP2200.

Module	Connector	Details	Model	Specifications
SVB-01	M-I/II	MECHATROLINK-I and MECHATROLINK-II Cables	JEPMC-W6002-□□ JEPMC-W6003-□□	• Between SVB-01 and I/O Unit • Between SVB-01 and SGDH-□□E+NS100 • Between SVB-01 and SGDH-□□E+NS115 • Between SVB-01 and SGDS-□□□1□□ With USB connector on both ends* Note: The JEPMC-W6003-□□ has a ferrite core.
			JEPMC-W6010-□□	• Between SVB-01 and SGD-□□□N • Between SVB-01 and SGDB-□□AN • Between USB connector and loose wires
			JEPMC-W6022	Terminator
SVA-01	CH1,CH2	SGDS Cable	JEPMC-W2040-□□	• Between SVA-01 and SGDS-□□□□1□
LIO-01 LIO-02	I/O	External I/O Cable	JEPMC-W2061-□□	Between LIO-01 or LIO-02 and external I/O
LIO-04	CN1,CN2	External I/O Cable	JEPMC-W6060-□□	Between LIO-04 and external I/O
Communication Modules	PORT	RS-232C Cable	JEPMC-W5310-□□	Between RS-232C port and 25-pin, D-sub connector (male)
			JEPMC-W5311-□□	Between RS-232C port and DOS
218IF-01	10Base-T	Ethernet Cable		Cross cable (Category 3 min.)
217IF-01	RS-422/485	RS-422 and RS-485 Cable	1010214-52A2JL	Module-side connector (manufactured by 3M)
			10114-3000VE	Cable-side connector (manufactured by 3M)
			10314-52A0-008	Shell (manufactured by 3M)
260IF-01	DeviceNet	DeviceNet Cable	MSTB2-5/5-GF-5.08AM	Module-side connector (manufactured by Phoenix Contact)
261IF-01	PROFIBUS	PROFIBUS Cable	17LE-13090-27(D33C)	Module-side connector (manufactured by Daiichi Denshi Kogyo)
EXIOIF	CN1IN, CN2OUT	EXIOIF Cable	JEPMC-W2091-□□	Between EXIOIF and EXIOIF

* Commercially-available USB cables cannot be used. Always use Yaskawa cables.

2.4.2 Accessories

Name	Model	Remarks
DIN Rail Mounting Clips	JEPMC-OP300	–
Battery	JZSP-BA01	ER3VC + Special Connector (BA000517)
Power Supply Connector	721-863/001-034	MBU-01 Unit Cable side (manufactured by WAGO, black)
	721-863/001-000	MBU-02 Unit Cable side (manufactured by WAGO, white)

2.5 Software

2.5.1 Software for Programming Devices

Name	Model	Remarks
MPE720	CPMC-MPE720 (Ver. 5.10 or later)*	CD-ROM (1 disk)

* Older versions cannot be used. Always use Ver. 5.10 or later.

3

System Startup

This chapter describes the startup procedure for the MP2200 system and provides sample programs for typical operation and control.

3.1 Outline

This section explains the system startup procedure when the sample program on the MPE720 installation disk is used. Details on the machine system design have been omitted here.

3.1.1 System Startup Flowchart

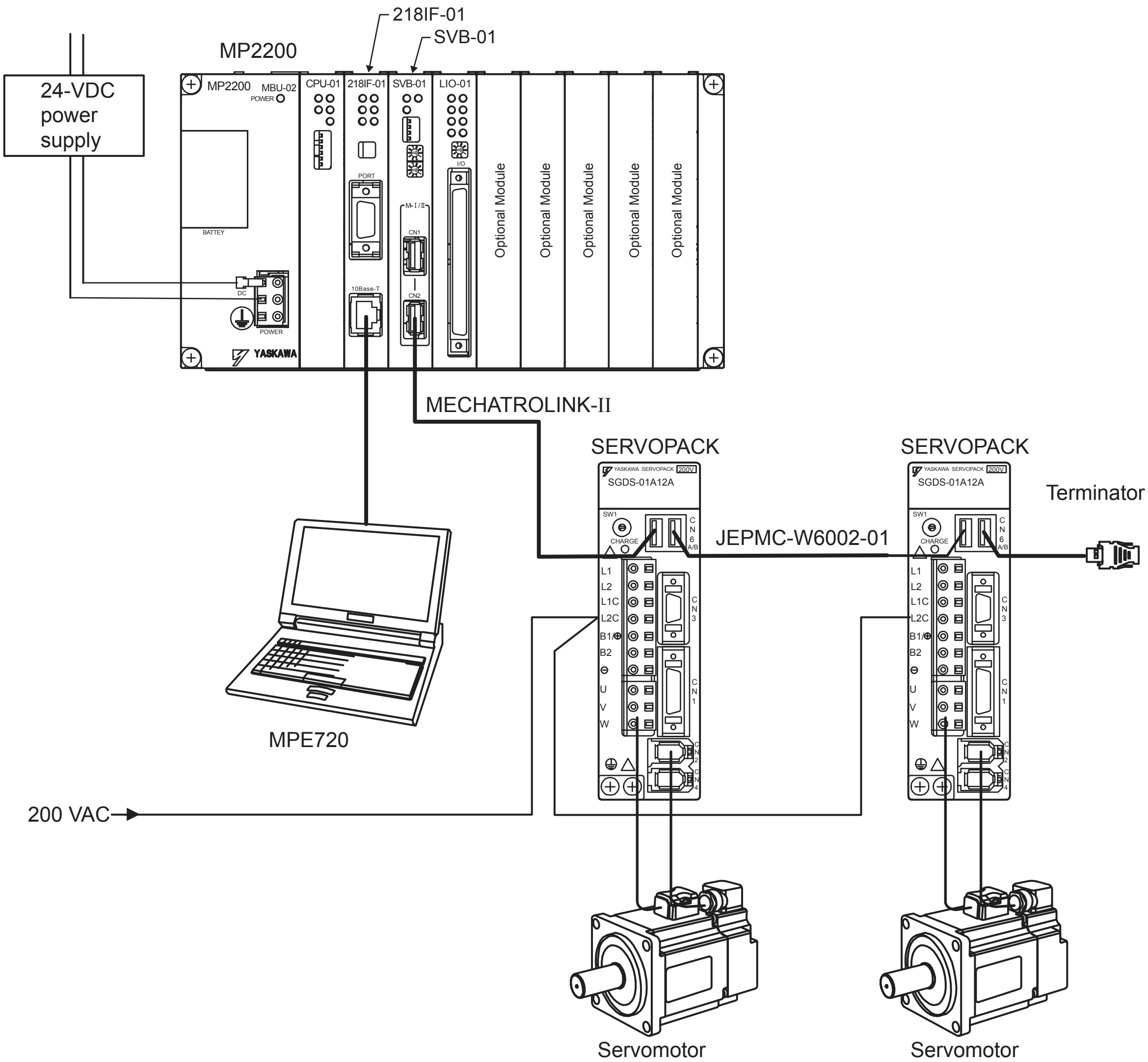
The system startup procedure is outlined below.

Refer to the references given in the right-hand column for information on each step.

1. Prepare the equipment needed for testing.	*3.1.3 Device Preparation*
2. Mount the 218IF-01 to the MP2200.	*Chapter 5 Mounting and Wiring*
3. Connect the MPE720, and wire the Servomotors and SERVOPACKs.	*3.1.4 Connecting and Wiring the System*
4. Initialize the SERVOPACKs.	*3.1.5 Initializing the System*
5. The connected devices are automatically confirmed.	*3.1.5 Initializing the System*
6. Install the sample programs and start the MPE720.	*3.1.6 Starting the MPE720*
7. Save the sample program and configuration definitions to flash memory.	*3.1.6 Starting the MPE720*
8. Execute the program and check the test operation.	*3.2 Sample Program 1: Manual Operation* *3.3 Sample Program 2: Positioning Control* *3.4 Sample Program 3: Phase Control with an Electronic Shaft* *3.5 Sample Program 4: Phase Control with an Electronic Cam*

3.1.2 System Configuration

The following diagram shows the configuration of devices to help describe the MP2200 system startup. The following description uses a Basic Unit with a 24-VDC power supply input as an example.



* The 24-VDC power supply is not required for a Basic Unit with a 100-VAC power supply input.

INFO Refer to *Chapter 5 Mounting and Wiring* for information on mounting Modules.

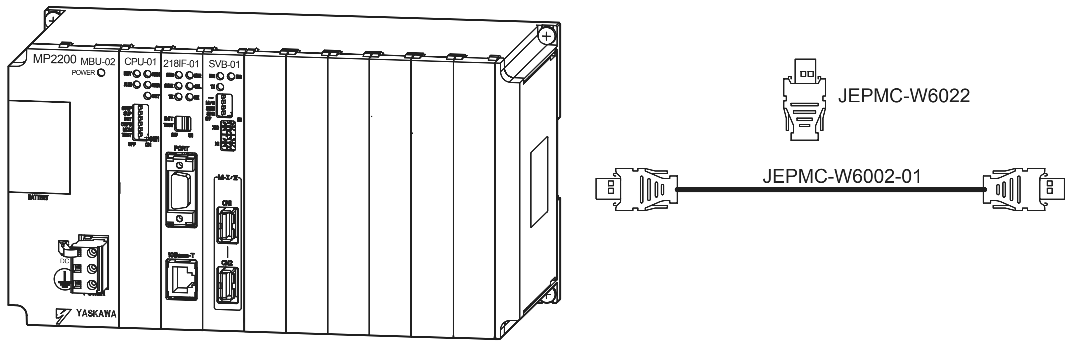
3

3.1.3 Device Preparation

Prepare the devices shown in the following tables. These devices are required for checking operation using the sample program.

(1) Controller-related Equipment

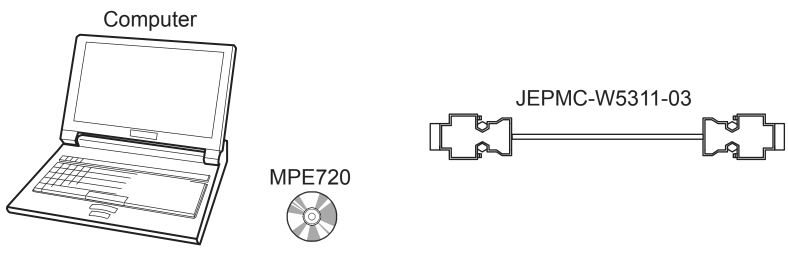
Name	Model	Quantity
Base Unit	JEPMC-BU2210 or JEPMC-BU2200	1
CPU-01 Module	JAPMC-CP2200	1
218IF-01	JAPMC-CM2300	1
SVB-01 Module	JAPMC-MC2310	1
MECHATROLINK Cable (1 mÅj	JEPMC-W6002-01	2
Terminator	JEPMC-W6022	1



(2) Programming Device-related Equipment

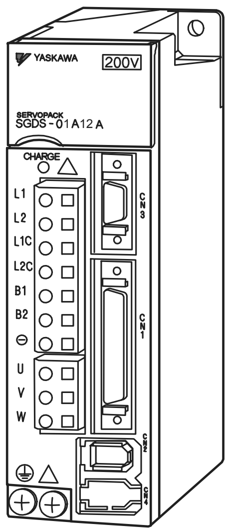
Name	Model	Quantity
MPE720	CPMC-MPE720	1
RS-232C Cable or Ethernet Cable	JEPMC-W5311-03 Commercially available cross cable	1
Computer	Commercially available product	1

Note: The MP2200 can be connected via RS-232C or Ethernet connections.

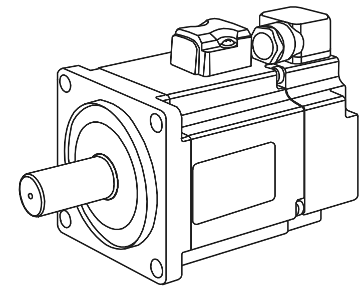


(3) Servodrive-related Equipment

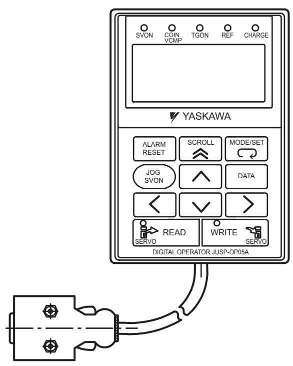
Name	Model	Quantity
Σ-III SERVOPACKs	SGDS-01A12A	2
Σ-III Servomotors	SGMAS-01ACA21	2
Motor Cables (3 m)	JZSP-CSM01-03	2
Encoder Cables (3 m)	JZSP-CSP01-03	2
Digital Operator	JUSP-OP05A	1



SERVOPACK



Servomotor



Digital Operator

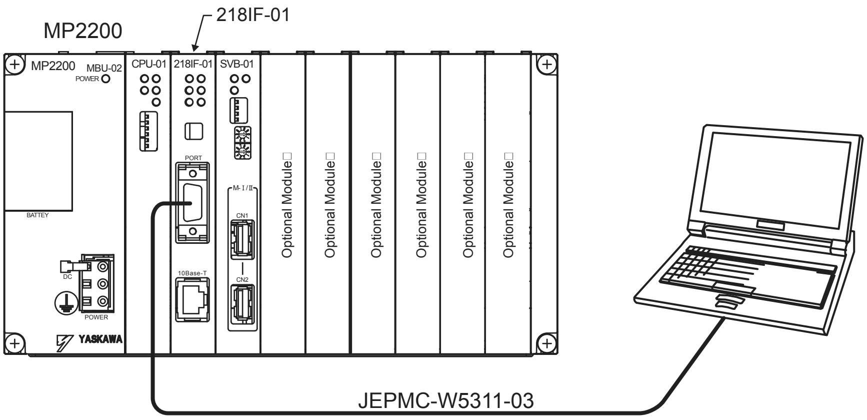
(4) Other Required Equipment

Name	Specifications	Quantity
24-VDC power supply	Current capacity of 2 A or greater	1

3.1.4 Connecting and Wiring the System

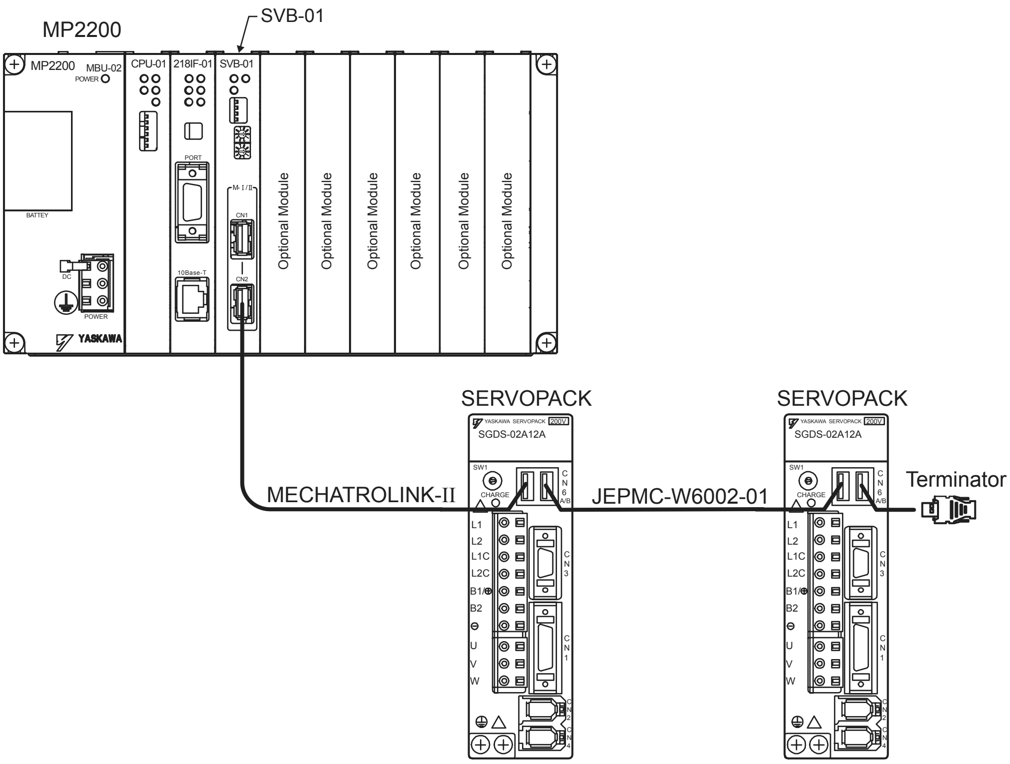
(1) Connecting the MPE720 and MP2200

The following figure shows how to connect the MPE720 and the 218IF-01 Module using a PP Cable.



(2) Connecting the MP2200 and SERVOPACKs

Use a MECHATROLINK Cable to connect the MP2200 and SERVOPACKs.

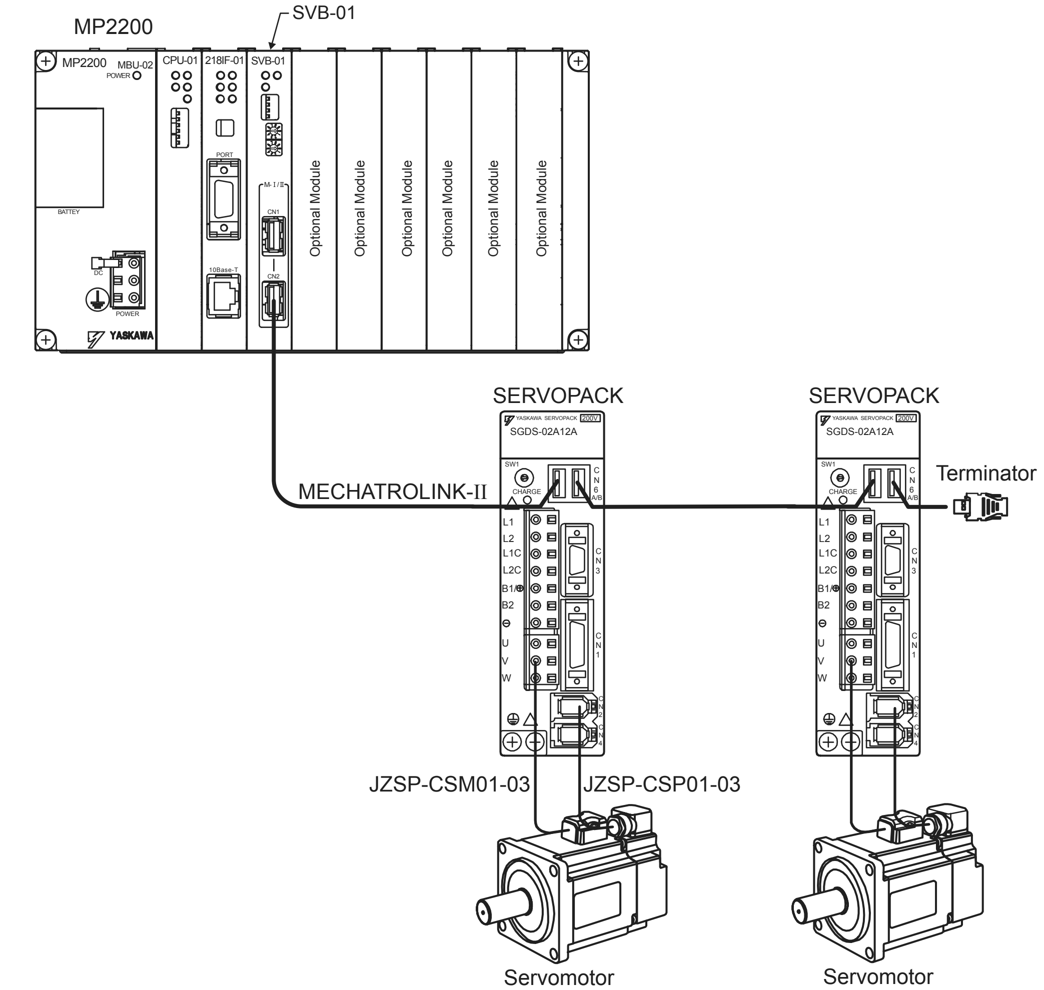


Set the SERVOPACK MECHATROLINK station numbers to 1 and 2.

The sample program is designed to operate with station numbers 1 and 2.

(3) Connecting SERVOPACKs and Servomotors

Use the motor cable and encoder cable to connect SERVOPACKs and Servomotors.



3.1.5 Initializing the System

This section describes the Σ-III SERVOPACK initialization and self-configuration procedures required when first starting a MP2200 system.

(1) Initializing Σ-III SERVOPACKs

This section explains the procedure for initializing the SERVOPACKs. Always initialize SERVOPACKs that have been brought from other systems. This initialization procedure is not required for SERVOPACKs that have not been used before.

1. Turn ON SERVOPACK.
   Turn ON the control power supply and main power supply for the SERVOPACK.
2. Initialize parameter settings.
   Return the parameter settings to the standard default settings using Fn005.
3. Disconnect SERVOPACK power.
   Turn OFF the control and main power supplies.
4. Turn ON SERVOPACK.
   Turn ON the control power supply and main power supply for the SERVOPACK.

The method for initializing the parameter settings (step 2, above) from the SERVOPACK Digital Operator is shown below.

(2) Initializing Parameter Settings (Fn005)

Initialize the parameters to return them to the default settings.

Note: The settings cannot be initialized if writing is prohibited using Fn010 or if the Servo ON signal is ON.

(a) Operation Procedure

Operation Keys	Display Example	Description
MODE/SET ∧ ∨	BB —FUNCTION— Fn004 Fn005 Fn006 Fn007	Press the MODE/SET Key to display the Utility Function Mode main menu. Press the ∧ ∨ Keys to select ***Fn005***.
DATA	BB Parameter Init Start : [DATA] Return: [SET]	Press the DATA Key. The display is switched to the Fn005 Parameter Initialization Screen. • If the display is not switched and NO-OP is displayed in the status display, the Write Prohibited Setting (Fn010 = 0001) is set. Check the setting and reset.
DATA	BB Parameter Init Start : [DATA] Return: [SET]	Press the DATA Key to initialize the parameters. *Parameter Init* will blink during initialization. When initialization has been completed, *Parameter Init* will stop blinking and the status display will change as shown below. BB → Done → A.941 Note: A.941 is a warning to indicate that the power must be cycled for a parameter that has been changed. Cycle the power after initializing the parameters. • Press the MODE/SET Key if you do not want to initialize parameters. The display will return to the Utility Function Mode main menu.

(3) Turning ON the Power Supply Again

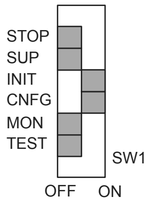
Parameter settings will be initialized but some of the parameters need the power to be cycled to enable the settings. Always turn OFF the power and then turn it ON again.

(4) Executing MP2200 Self-configuration

Execute self-configuration to automatically configure the Optional Modules mounted to the Basic Unit and the devices connected to the MECHATROLINK.

This section explains the method for executing self-configuration. The power to Σ-III SERVOPACKs has already been turned ON prior in this procedure.

1. Turn OFF the power.
   Turn OFF the Basic Unit 24-VDC power supply.



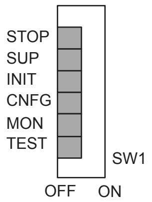
2. Set DIP switches.
   Turn ON the INIT and CNFG pins on the DIP switch (SW1) on the Basic Unit.

3. Turn ON the power.
   Turn ON the Basic Unit 24-VDC power supply.

4. Check the display.
   Check that the LED indicators on the Basic Unit change as shown below.

RDY ○	○ RUN	⇨	RDY ○	★ RUN	⇨	RDY ●	● RUN
ALM ●	● ERR		ALM ○	○ ERR		ALM ○	○ ERR
TX ○	○ BAT		TX ●	○ BAT		TX ●	○ BAT

○ Not lit ● Lit ★ Flashing



5. Reset DIP switch.
   Turn OFF the INIT and CNFG pins on the DIP switch (SW1) on the Basic Unit.

IMPORTANT

- INIT Switch

  RAM data will be cleared if the INIT pin on the DIP switch on the CPU Module is turned ON and the power is turned ON. Flash memory data is read when the INIT switch is turned OFF and the power is turned ON. Therefore, always save data to the MP2200 flash memory before turning OFF the power when writing or editing programs.

  Refer to *3.1.6 Starting the MPE720* for information on saving data to flash memory.

- Turning OFF Power after Executing Self-configuration

  Do not turn OFF the 24-V power supply to the MP2200 after executing self-configuration until the definitions data has been saved to flash memory in the MP2200. If the power is turned OFF somehow before the data is saved to flash memory, execute self-configuration again.

3.1.6 Starting the MPE720

This section describes the preparations for connecting the MPE720 to the MP2200, and the method for installing the sample program for the MP2200.

(1) MPE720 Startup Procedure

Make sure the MPE720 System Software is installed in advance. Refer to the *Machine Controller MP900/ MP2000 Series Programming Device Software MPE720 User's Manual* (Ref. No. SIEPC88070005) for information on installing the MPE720. The startup procedure is shown in the following flow-chart.

1. Starting the MPE720
   Start the MPE720.
2. Communication settings
   Define communications with the MP2200.
3. Creating group folders
   Create a group folder.
4. Creating an order folder
   Create an order folder.
5. Creating a controller folder
   Create a controller folder.
6. Logging on online
   Log on online to the MP2200.
7. Loading the sample programs
   Load the sample programs from the MPE720 system CD-ROM.
8. Transferring individual sample programs
   Transfer the sample programs individually.
9. Setting individual parameters
   Set the individual parameters to match the sample program.
10. Saving to flash memory
    Save the sample program to the MP2200 flash memory.
11. All program file dump
    Back up MP2200 data on the computer hard disk.

(2) Starting the MPE720

Start the MPE720 using the procedure below.

1. Double-click the **MPE720** icon in the YE_Applications Folder.

Double-click

2. The File Manager Window will be displayed.

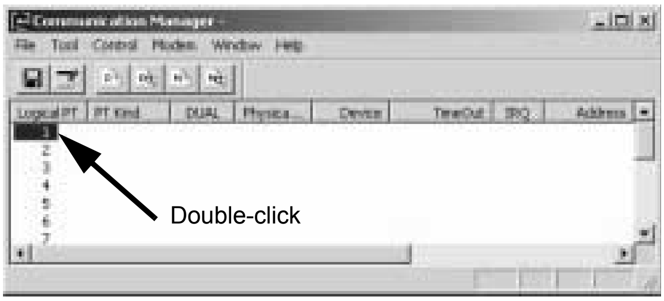
(3) Communication Settings

Make communication settings for connecting the MPE720 and the MP2200 using the procedure below. These settings are not required if the communication settings have already been made.

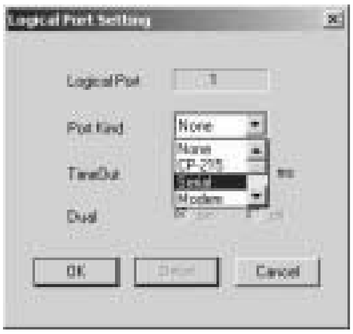
1. When the MPE720 is started, the File Manager and Communication Process Button will be displayed on the Toolbar at the bottom of the screen. Click the **Communication Process** button to open the Communication Process Window.

Click

2. Double-click ***Logical PT number 1*** in the Communication Process Window to display the Logical Port Setting Window.

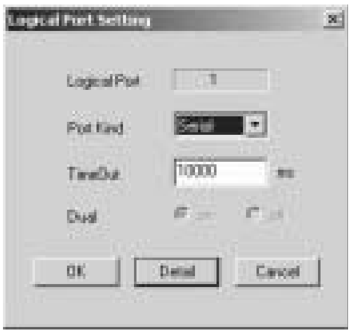


3. For RS-232C connections, select ***Port Kind - Serial*** in the Logical Port Setting Window.

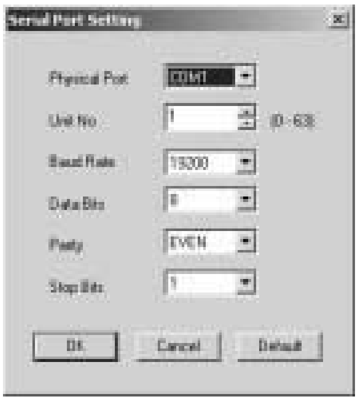


4. Setting Serial Communication Ports

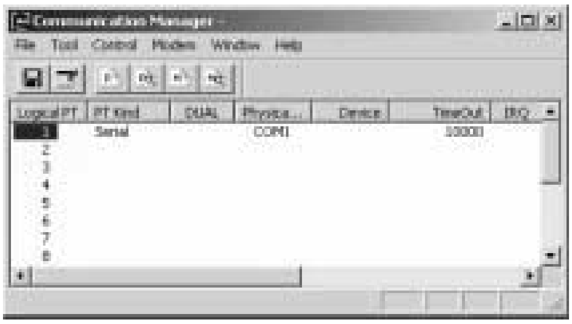
   a) Click the **Detail** button in the Logical Port Setting Window.



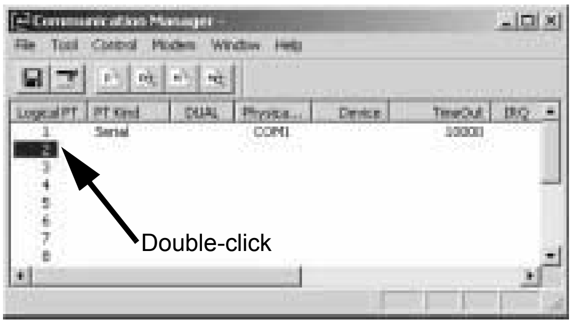
b) The Serial Port Setting Window will be displayed. Match the settings under Physical Port to the computer’s serial communication port. Leave the other items on the default settings. Once the settings have been completed and checked, click the **OK** button.



c) The Logical Port Setting Window will be displayed. Click the **OK** button again. The screen will return to the Communication Process Window. Check that *Serial* has been allocated to the Logical PT number 1.

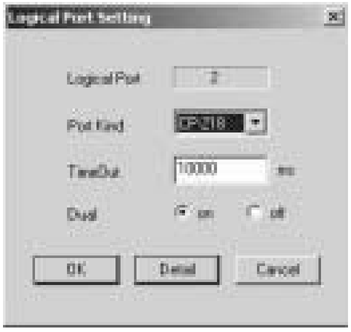


5. Ethernet Connections
   Double-click ***Logical PT number 2*** in the Communication Process Window to display the Logical Port Setting Window.

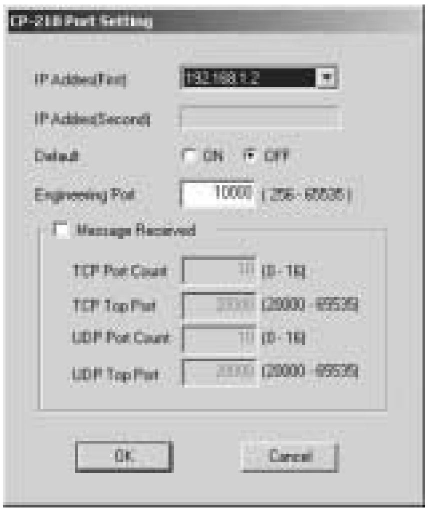


6. Ethernet Settings

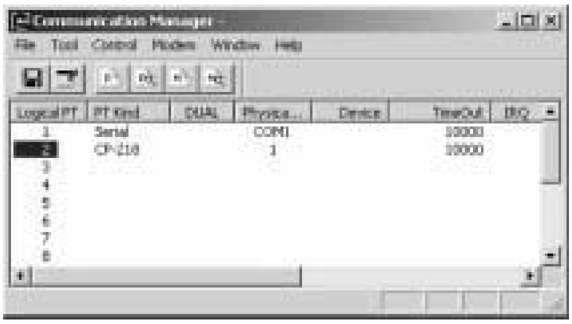
a) Select ***Port Kind - CP-218*** in the Logical Port Setting Window and click the **Detail** button.



b) The CP-218 Port Setting Window will be displayed. Select ***OFF*** for *Default* and enter the computer IP address in the *IP Address (First) field*. Leave the other items on the default settings. Once the settings have been completed and checked, click the **OK** button.



c) The Logical Port Setting Window will be displayed. Click the **OK** button again. The screen will return to the Communication Process Window. Check that *CP-218* has been allocated to the Logical PT number 2.

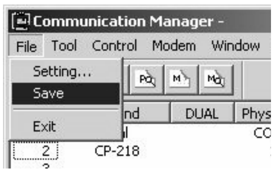


3

7. Saving Communication Port Settings

   Save the communication port settings. These settings will be used as the communication port information whenever the communication process is started. The procedure for saving the communication port settings is shown below.

   a) Click ***File - Save***.

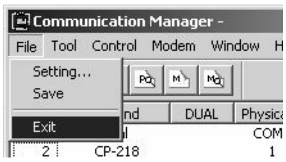


   b) A save confirmation window will be displayed. Click the **Yes** button.

8. Starting the Communication Process Again

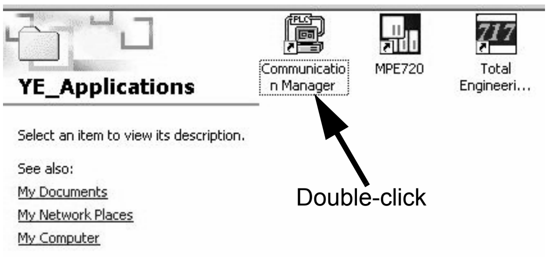
   The communication process must be started again when settings have been made or changed.

   a) Select ***File - Exit*** to close the Communication Process Window.



   b) A confirmation message will be displayed. Click the **Yes** button.

   c) Double-click the **Communication Manager** Icon in the YE_Applications Folder to reopen the Communication Process Window.



(4) Creating Group Folders

Create a group folder in the File Manager Window, using the procedure below.

Example: Folder name: MP2200

Create a group folder using the procedure below.

1. Right-click the root directory and select ***New - Group folder***.

2. Enter the group folder name in the Make New Folder Window and click the **OK** button. The group folder name must be 8 characters or less.

3. The new group folder *MP2200* will be created. Double-click the root directory or click the ⊞ button to display the *MP2200* Group Folder.

3

(5) Creating an Order Folder

Create an order folder using the procedure below.

Example: Folder name: YESAMPLE

1. Right-click the **MP2200** Group Folder and select ***New - Order Folder***.

2. Enter the order folder name in the Make New Folder Window and click the **OK** button. The order folder name must be 8 characters or less.

3. The new “YESAMPLE” Order Folder will be created. Double-click the **MP2200** Group Folder or click the ⊞ button to display the *YESAMPLE* order folder.

(6) Creating a Controller Folder

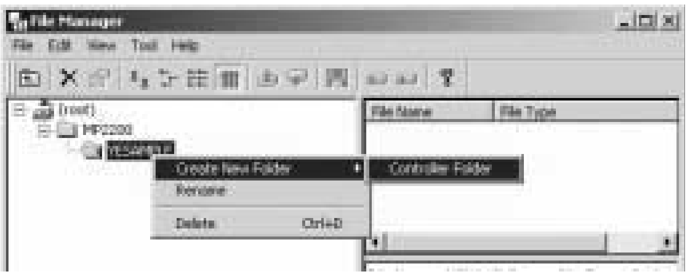
Register the new controller to be used to create the program using the procedure below.

Controller name: 2200SMPL

Controller type: MP2200

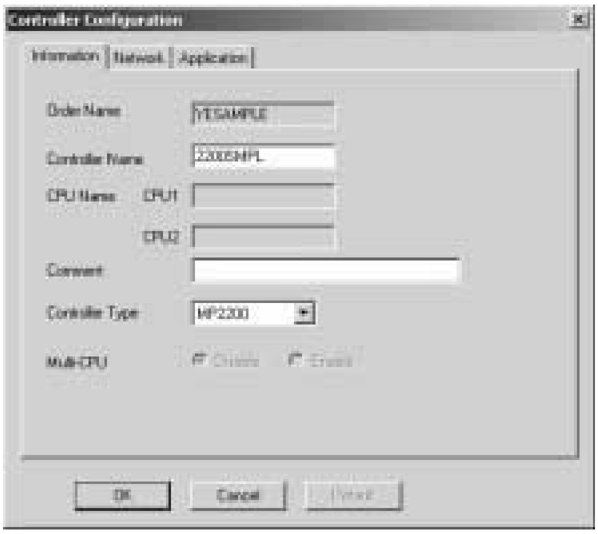
Create a controller folder using the procedure below.

1. Right-click the **YESAMPLE** Order Folder and select ***Create New Folder - Controller Folder***.

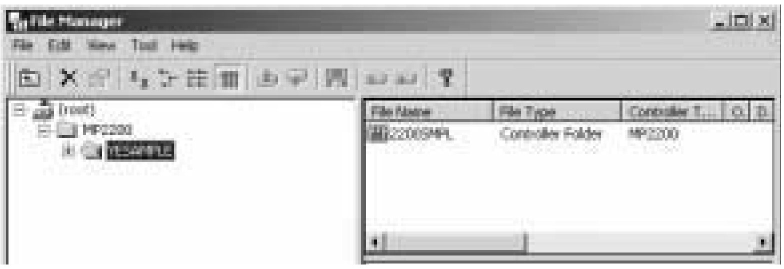


2. Set the Controller Name and Controller Type shown below, and click the **OK** button.

   Controller name: 2200SMPL
   Controller type: MP2200



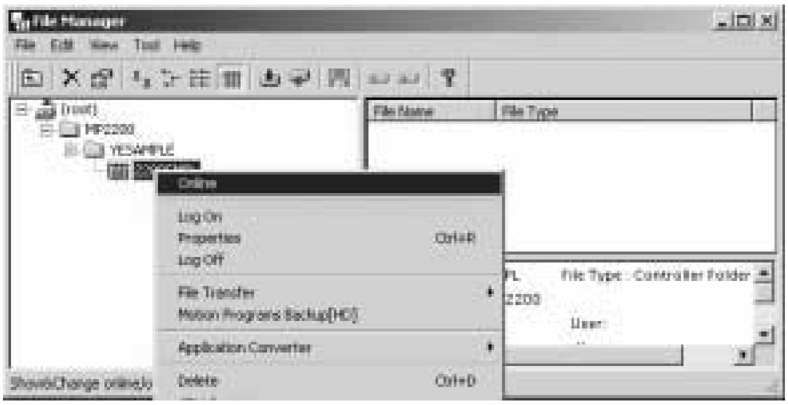
3. A new controller folder *2200SMPL* will be created. Double-click the **YESAMPLE** Order Folder or click the ⊞ button to display the *2200SMPL* Controller Folder.



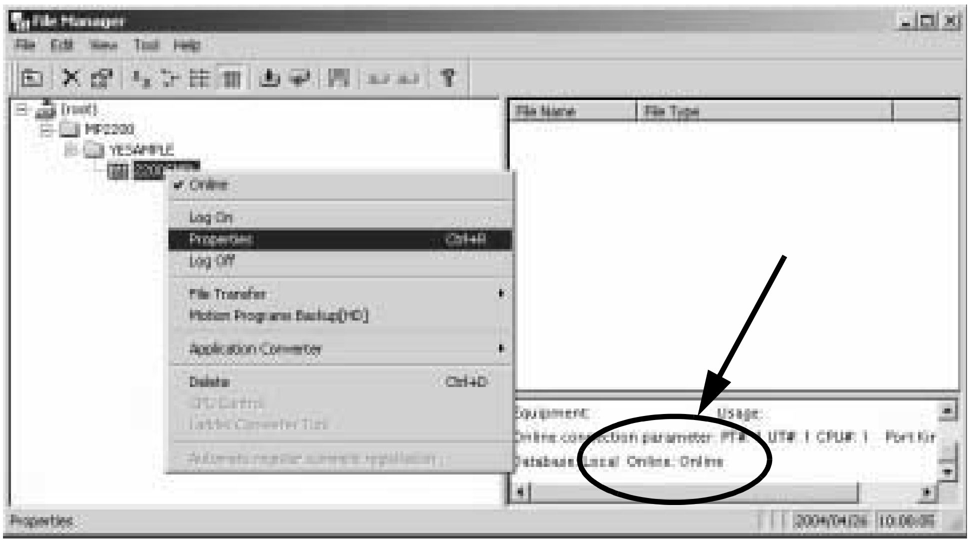
(7) Logging On Online

Log on online to the MP2200 using the procedure outlined below.

1. Right-click the **2200SMPL** Controller Folder and select ***Online***. The mode will change from offline to online.

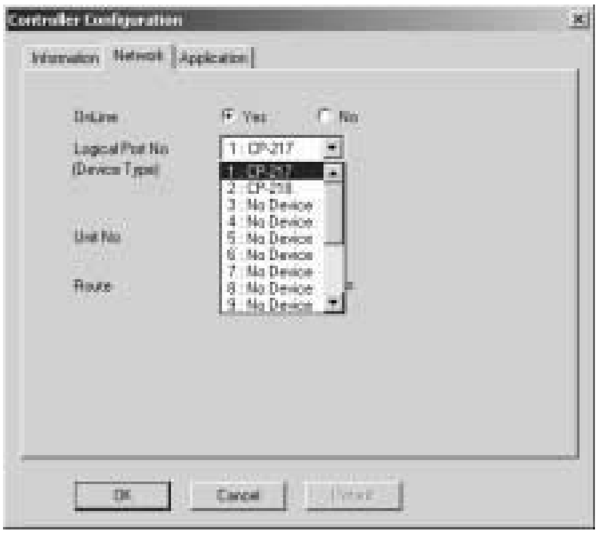


2. Right-click the **2200SMPL** Controller Folder and check that there is a check mark next to Online. Also check that *Online* at the bottom right of the screen is listed as *Connected*, then select ***Properties***.



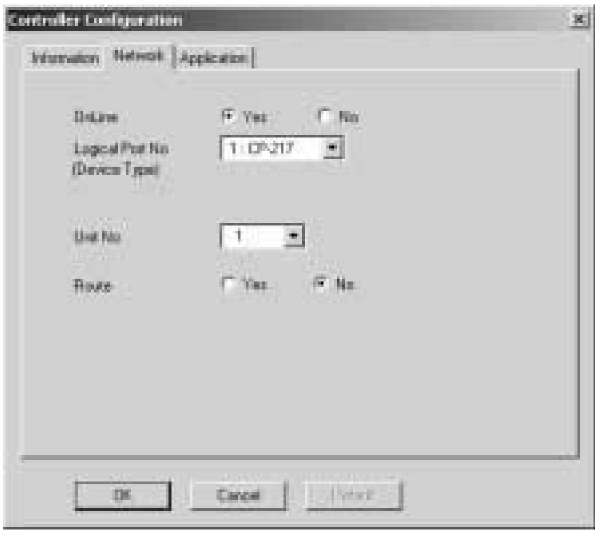
3. The Controller Configuration Window will be opened. Select the **Network** Tab. Online should be set to *Yes*.

   Under Logical Port Number (Device Type), select the same Logical PT that was set for the communication process.



Note: CP-217: RS-232C connection
CP-218: Ethernet connection

4. For RS-232C connections, leave all settings other than Logical Port Number (Device Type) on the default settings.

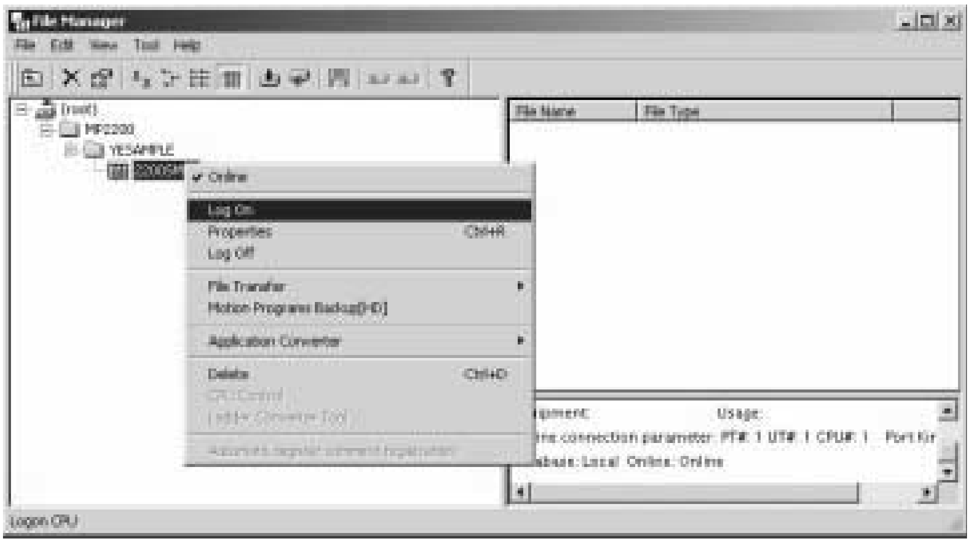


5. For Ethernet connections, make the settings shown below.

6. A confirmation message will be displayed. Click the **Yes** button.

7. Logging On Online

a) Right-click the **2200SMPL** Controller Folder and select ***Log On***.

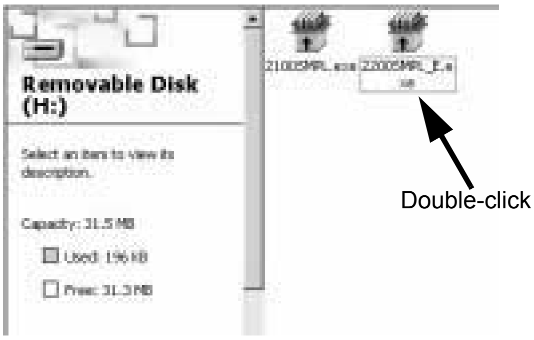


b) Input the user name *USER-A* and the password *USER-A* and click the **OK** button.

(8) Loading the Sample Programs

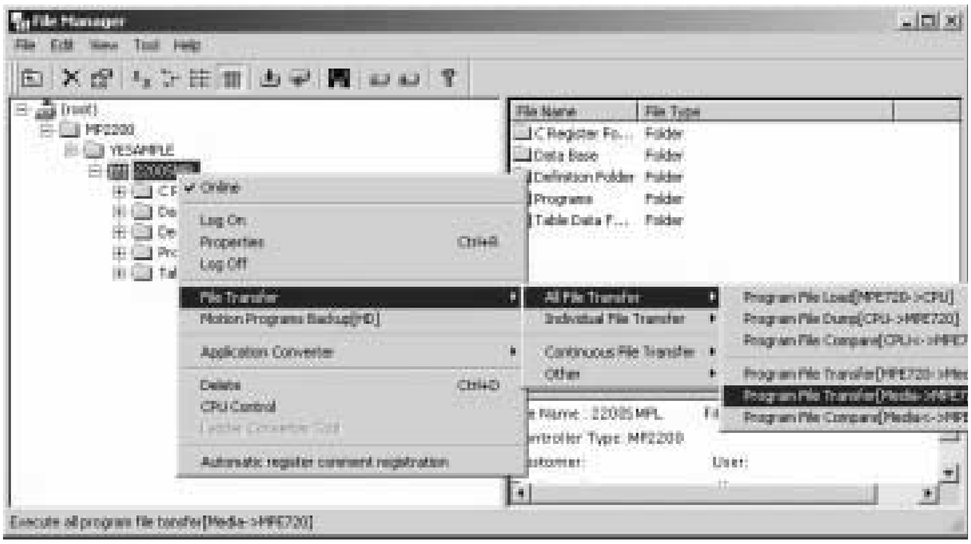
Load the sample programs on the MPE720 system CD-ROM using the procedure below. Insert MPE720 system CD-ROM into the computer CD-ROM drive.

1. Double-click the **2200 SMPL-E.EXE** file in the SAMPLE Folder on the CD-ROM.



2. The window for specifying the destination of the file will be displayed. Specify the destination of the file and click the **Decompress** button.

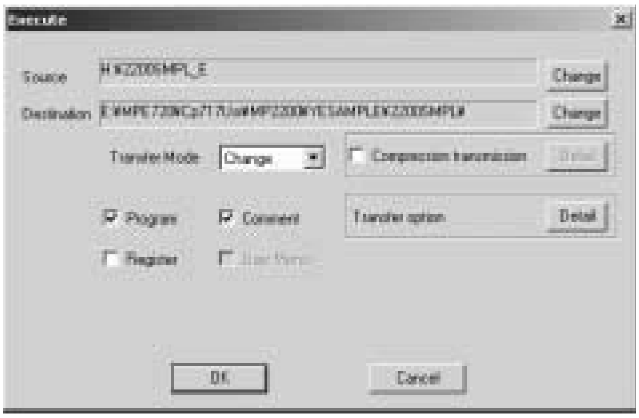
3. Right-click the **2200SMPL** Controller Folder and select ***File Transfer - All File Transfer - All Program File Transfer (Other Media - HD)***.



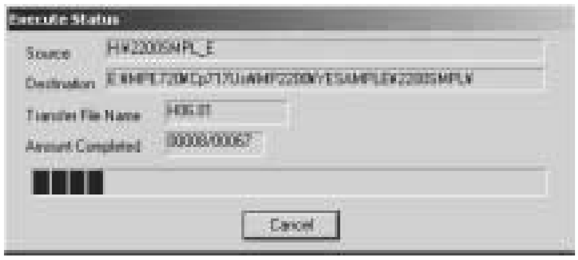
4. The Execute Window will be displayed. The transfer source path must be changed, so click the **Change** button.

5. The Transfer Path Window will be displayed. Make the settings given below and click the **OK** button.
   Drive: Select the drive where the sample program was stored. (The A drive, in this example.)
   Transfer path: 2200SMPL

6. The Execute Window will be displayed. Click the **OK** button.

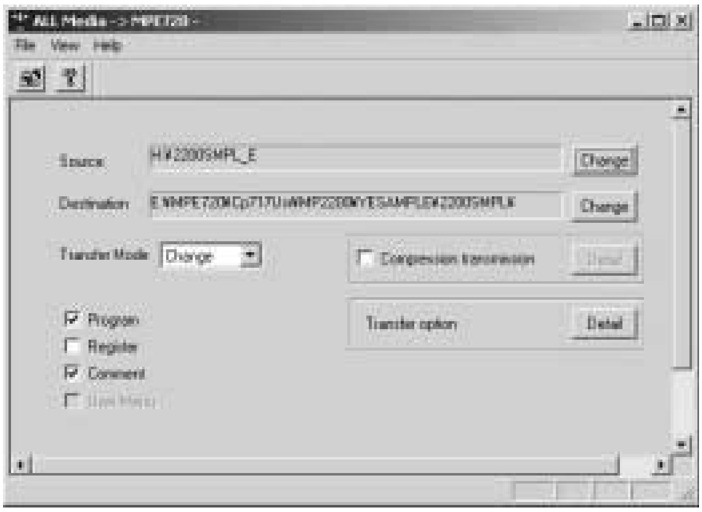


7. The Execute Status Window will be displayed. Wait until the transfer has been completed.



8. A message will appear when the transfer has been completed. Click the **OK** button.

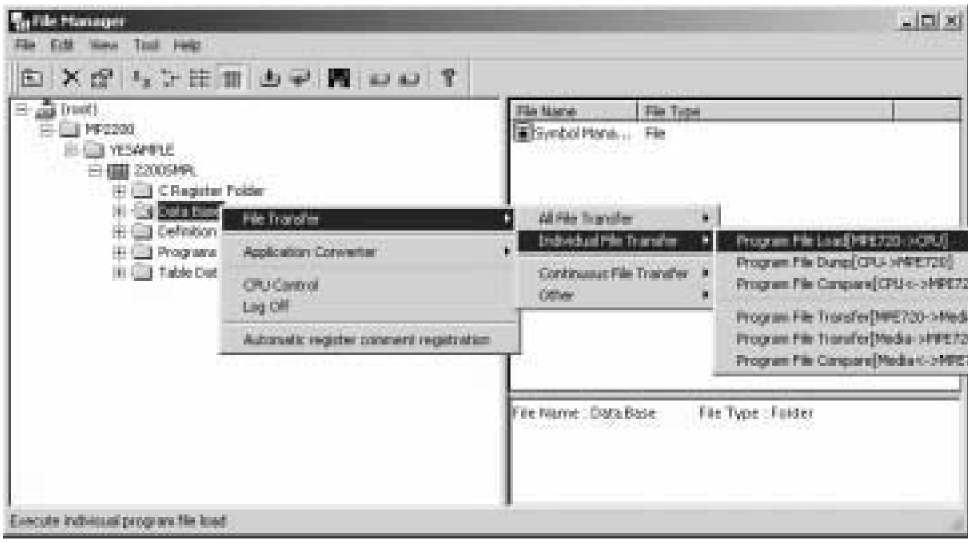
9. The All File Transfer Disk to Disk Window will be displayed. Select ***File - Exit***.



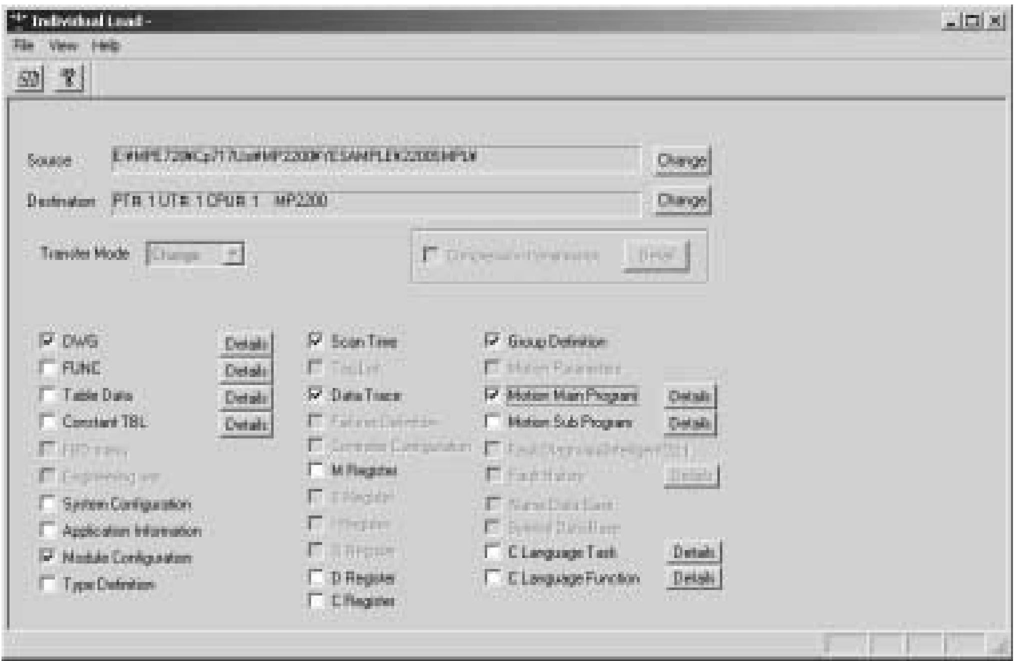
(9) Individual Loading of Sample Programs

Transfer sample programs to the MP2200 individually using the procedure below.

1. Right-click the **2200SMPL** Controller Folder and select ***File Transfer - Individual File Transfer - Individual Program File Load (HD → CPU)***.

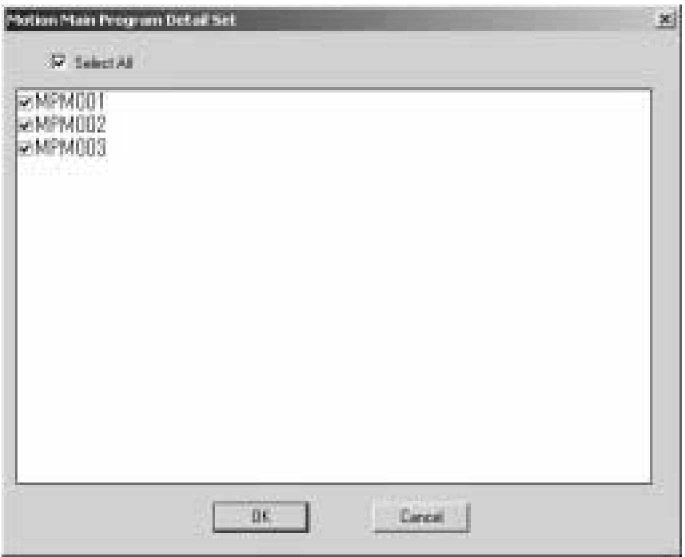


2. The Individual Load Window will be displayed. Select the following transfer items:
   - DWG
   - Scan Time
   - Data Trace
   - Motion Main Program



3. Click the **Details** button to the right of DWG to display the DWG Detail Data Set Window. Select ***Select All*** and click the **OK** button.

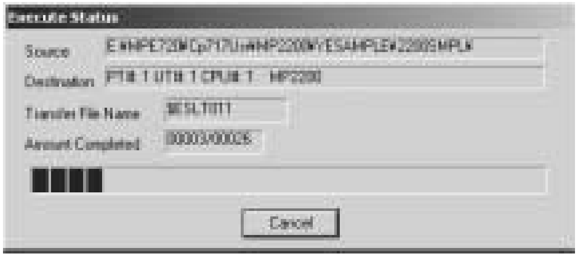
4. Click the **Details** button to the right of Motion Main Program to display the Motion Main Program Detail Set Window. Select ***Select All*** and click the **OK** button.



5. The Individual Load Window will be displayed. Select ***File - Execute***.

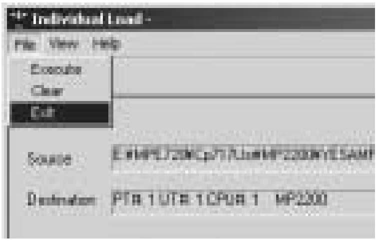
6. A confirmation message will be displayed. Click the **Yes** button.

7. The Execute Status Window will be displayed. Wait until the transfer has been completed.



8. A message will appear when the transfer has been completed. Click the **OK** button.

9. The Individual Load Window will be displayed. Select ***File - Exit***.

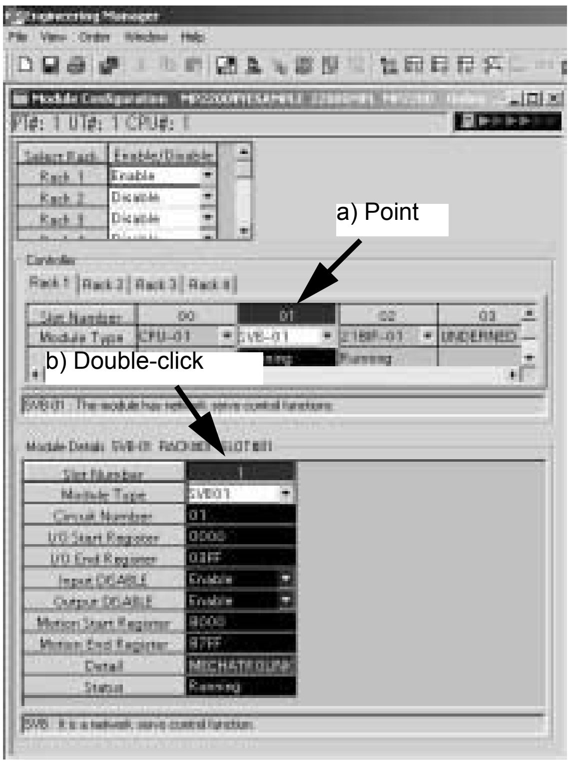


(10) Setting Motion Fixed Parameters

Set the MP2200 motion fixed parameters to match the sample program using the procedure below.

1. Opening the Module Configuration Window.
   a) Double-click the **2200SMPL** Controller Folder in the File Manager Window to display the 5 folders contained within it.
   b) Double-click the **Definition** Folder to display the 6 folders inside that folder, then double-click the **Module Configuration** Folder.

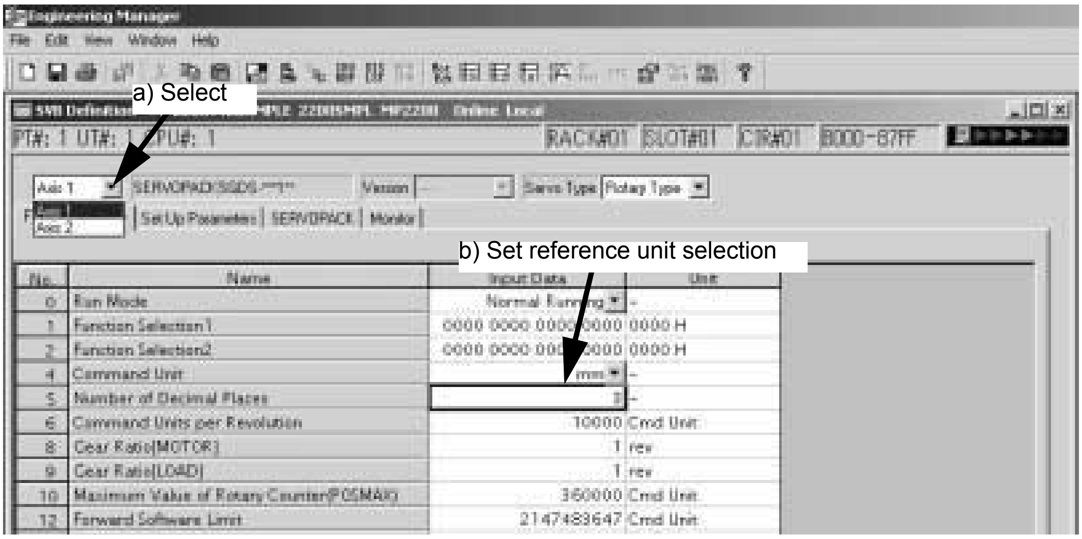
2. Opening the Motion Fixed Parameter Window.
   The Engineering Manager Window will open and the Module Configuration Window will be displayed inside that.
   a) Point to **02** in the Controller section of the Module Configuration Window.
   b) Double-click **1** in the Module Details section.



3. Setting the Fixed Parameters for Axis 1
   Display the SVB Definition Window in the Engineering Manager Window. Check that the Fixed Parameters Tab Page has been selected.

   a) Select ***Axis 1*** from the list of axes at the top left of the SVB Definition Window.

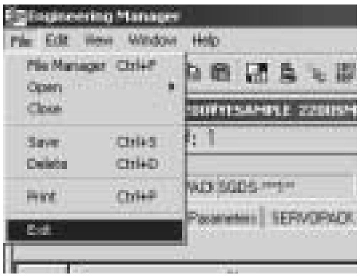
   b) Select ***mm*** as the Reference Unit for parameter 4 on the Fixed Parameters Tab Page.



4. Saving Fixed Parameter Settings
   Select ***File - Save*** in the Engineering Manager Window.

5. Setting and Saving Axis 2 Fixed Parameters
   Referring to steps 3 and 4 in this procedure, select ***Axis 2*** and make the settings the same way as for axis 1.

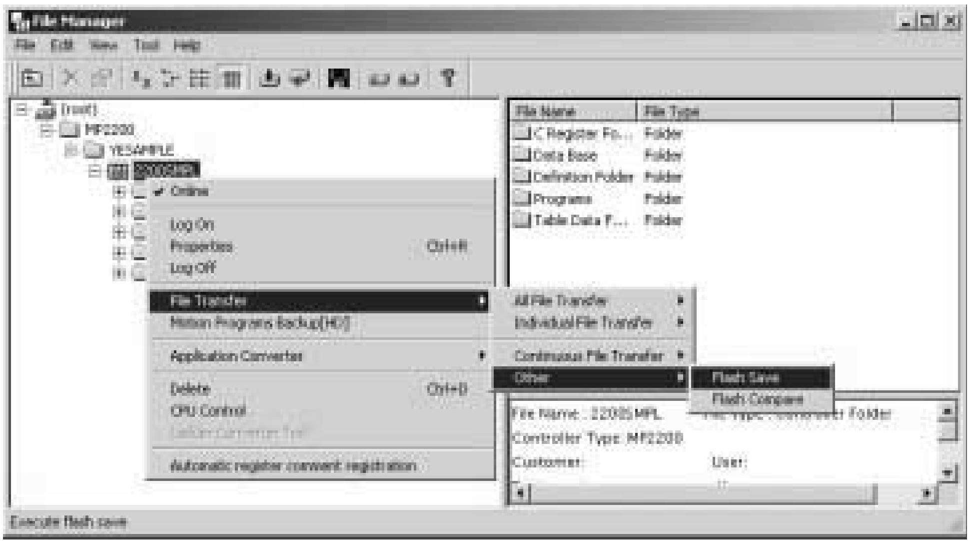
6. Closing the Engineering Manager Window
   Select ***File - Exit*** in the Engineering Manager Window.



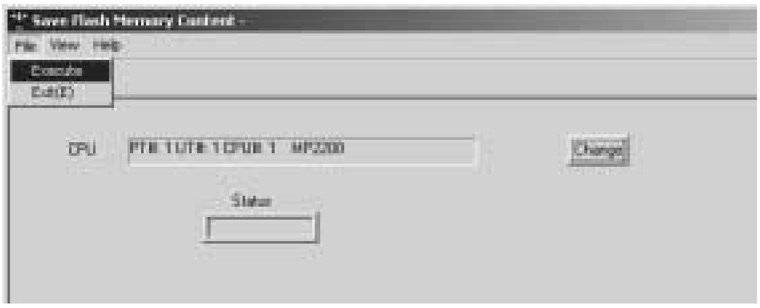
(11) Saving to Flash Memory

Save sample programs that have been transferred individually to the MP2200 to the MP2200 flash memory using the procedure below.

1. Right-click the **2200SMPL** Controller Folder and select ***File Transfer - Other - Flash Save***.

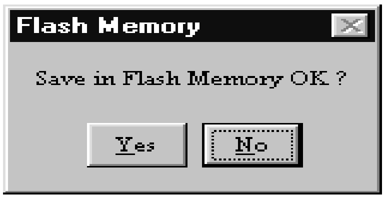


2. The Save Flash Memory Content Window will be displayed. Select ***File - Execute***.



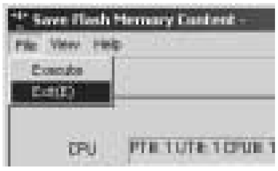
3. A message appears to confirm that the CPU will be stopped. Click the **Yes** Button.

4. A confirmation message will be displayed. Click the **Yes** button.



5. A message will appear when the save has been completed normally. Click the **OK** button.

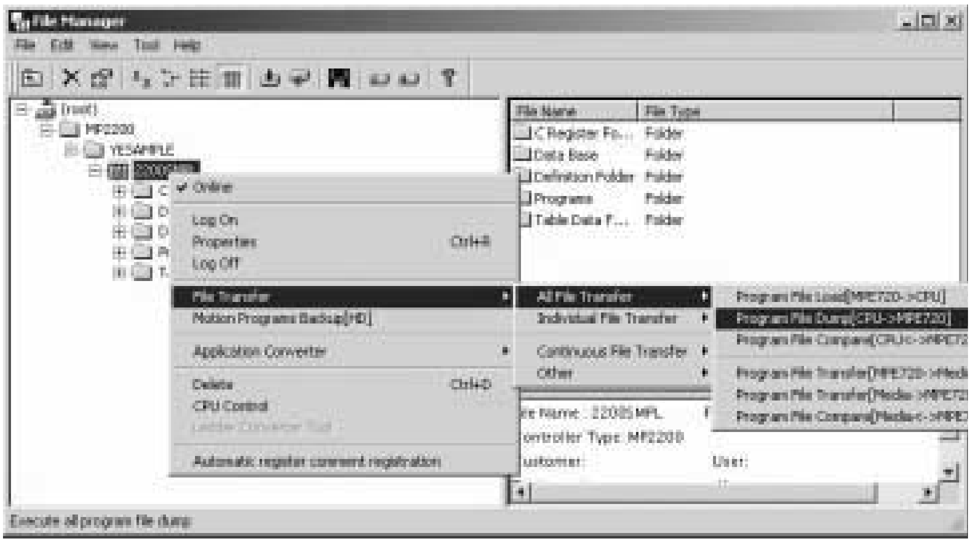
6. The Save Flash Memory Content Window will be displayed. Select ***File - Exit***.



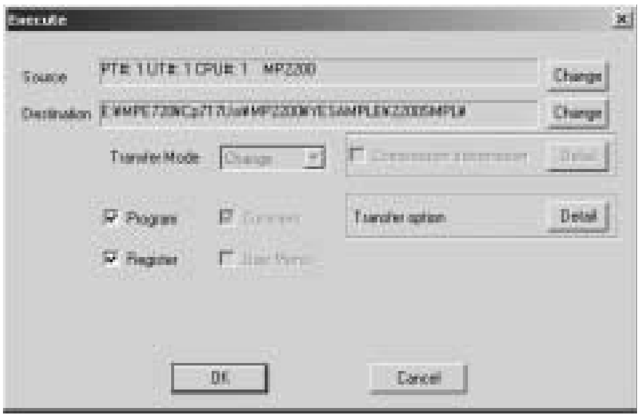
(12) All Program File Dump

Execute an All Program File Dump to back up to the computer module configuration definitions self-configured by and programs edited by the MP2200.

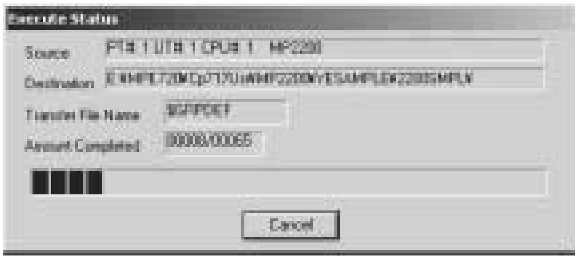
1. Right-click the **2200SMPL** Controller Folder and select ***File Transfer - All File Transfer - All Program File Dump (CPU → HD)***.



2. The Execute Window will be displayed. Click the **OK** button.

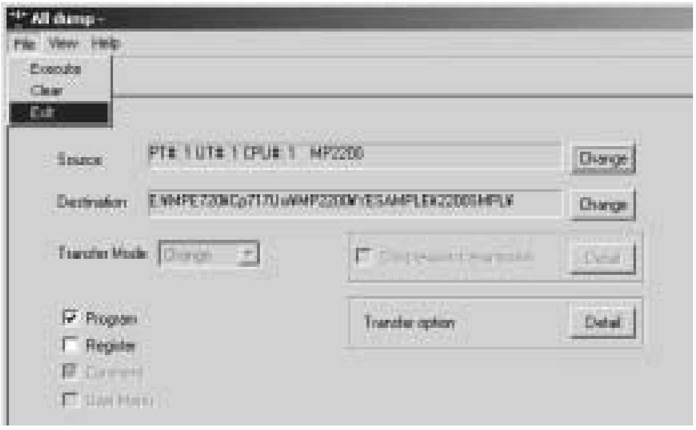


3. An Execute Status Window will be displayed. Wait until the transfer has been completed.



4. A message will appear when the transfer has been completed. Click the **OK** button.

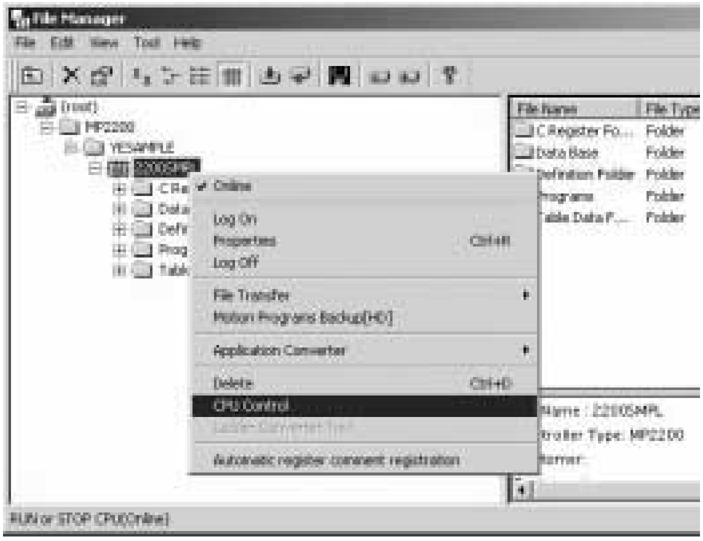
5. The All Dump Window will be displayed. Select ***File - Exit***.



(13) CPU RUN Settings

The procedure for starting the CPU, which was set to STOP during the flash save process, is explained below.

1. Right-click the **2200SMPL** Controller Folder and select ***CPU Control***.



2. The Controller Running Status Window will be displayed. Click the **RUN** button.

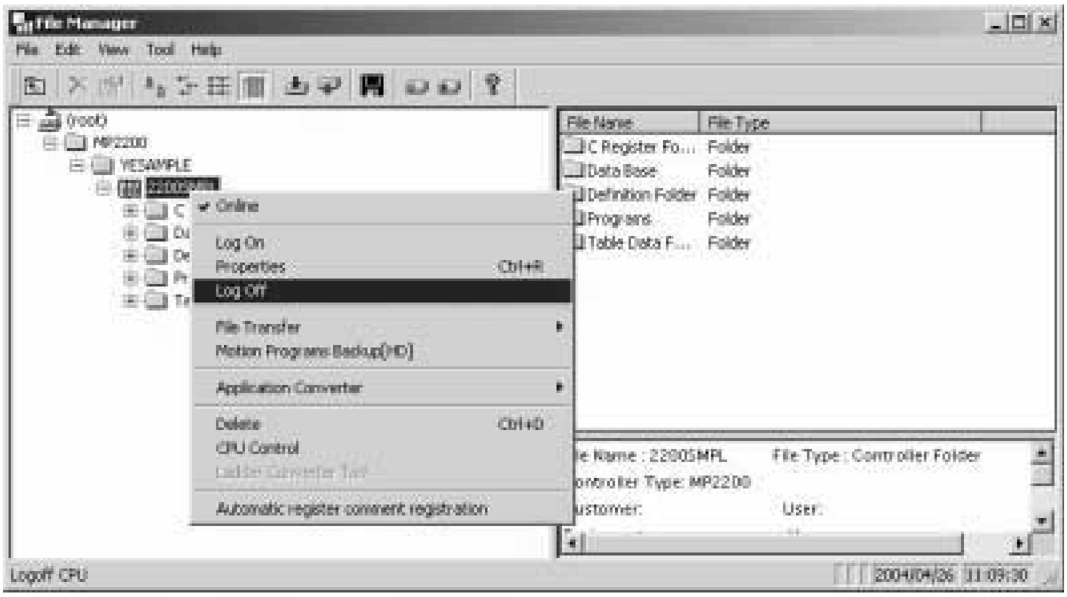
3. A confirmation message will be displayed. Click the **Yes** button. Check that the RUN LED indicator on the CPU Module is lit.

4. The Controller Running Status Window will be displayed again. Click the **Close** button.

(14) Logging Off

Log off when you have finished with the MPE720 using the procedure below.

1. Right-click the **2200SMPL** Controller Folder and select ***Log Off***.



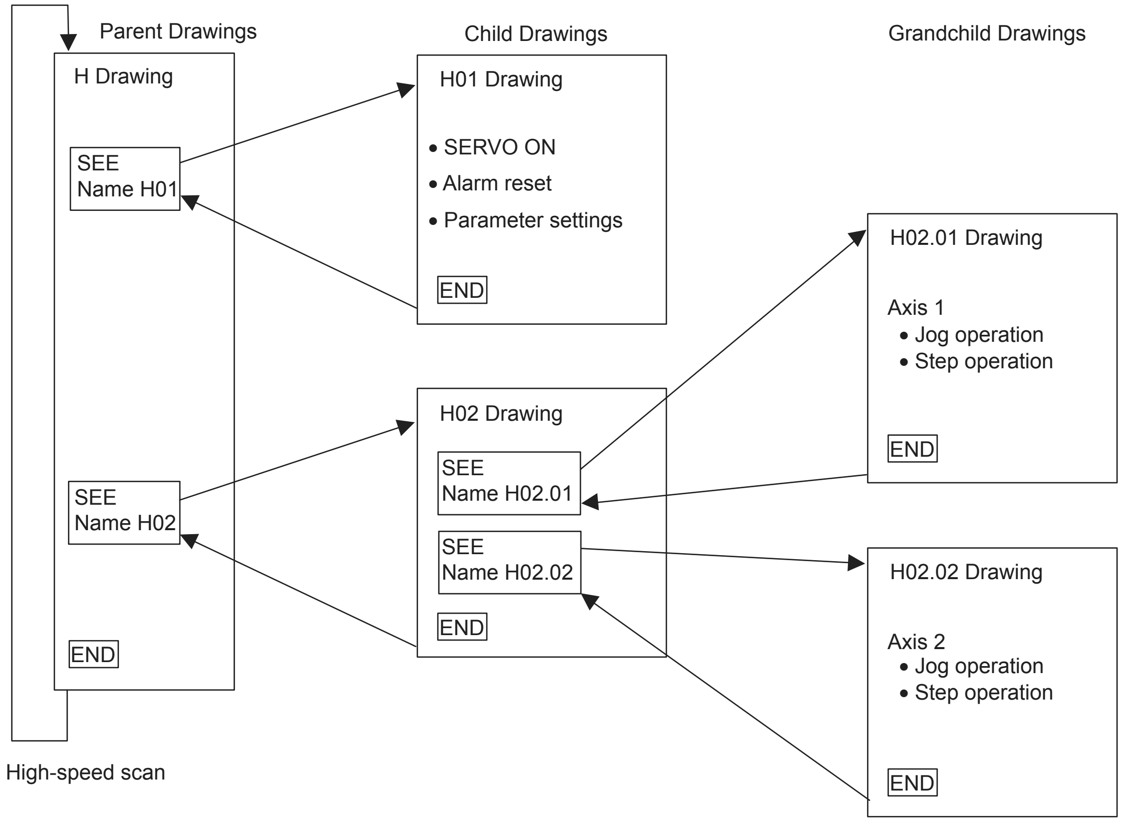
2. A confirmation message will be displayed. Click the **Yes** button.

3.2 Sample Program 1: Manual Operation

3.2.1 Description

(1) Program Outline

- The H01 drawing (ladder program) turns ON the servo, resets alarms, and sets parameters.
- The H02.01 drawing (ladder program) controls jog and step operation for axis 1.
- The H02.02 drawing (ladder program) controls jog and step operation for axis 2.
- Refer to *3.2.3 Program Details* for details on the sample program.



IMPORTANT	This sample program has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual applications.

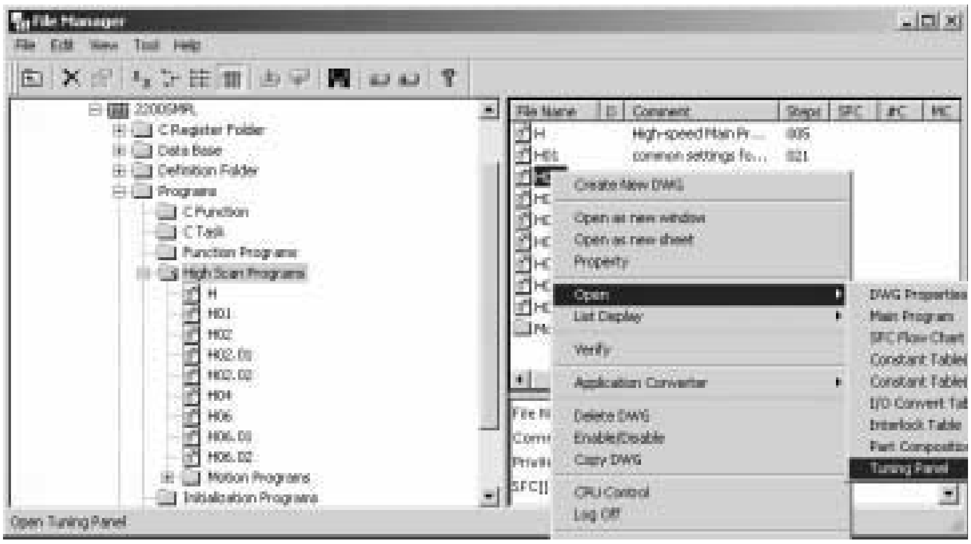
3.2.2 Operation

(1) Display of Tuning Panel Window

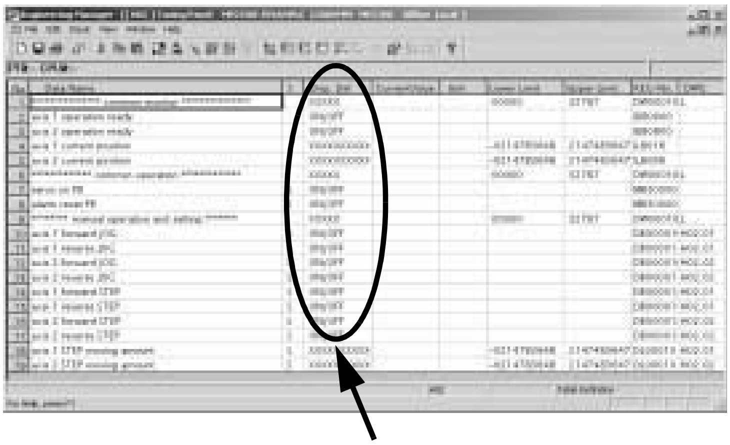
In this sample program, run, stop, and other operations can be checked from a Tuning Panel Window.

Use the following procedure to display the Tuning Panel Window.

1. Log on online and open the **2200SMPL** Controller Folder, then the **Programs** and **High Scan Programs** folders in the MPE720 File Manager Window.
2. Right-click the H02 drawing in the **High Scan Programs** Folder and select ***Open - Tuning Panel***.



3. The Tuning Panel Window for the H02 drawing will be displayed.



Input position and current value.

The details on the Tuning Panel Window display are shown in the following table.

No.	Data Name	S	Display Definition	Current Value	Units	Lower Limit	Upper Limit	REG-No.	DWG
1	***************Common monitor***************		XXXXX	00000		00000	32767	DW00010	L
2	Axis 1 operation ready		ON/OFF	OFF				IB80000	
3	Axis 2 operation ready		ON/OFF	OFF				IB80000	
4	Axis 1 current position		XXXXXXXXXX	0000000000		–0214783648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		–0214783648	2147483647	IL8096	
6	***************Common operation***************		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	OFF				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	************Manual operation and setting************		XXXXX	00000		00000	32767	DW00010	L
10	Axis 1 Forward Jog	S	ON/OFF	OFF				DB000010	H02.01
11	Axis 1 Reverse Jog	S	ON/OFF	OFF				DB000011	H02.01
12	Axis 2 Forward Jog	S	ON/OFF	OFF				DB000010	H02.02
13	Axis 2 Reverse Jog	S	ON/OFF	OFF				DB000011	H02.02
14	Axis 1 Forward Step	S	ON/OFF	OFF				DB000012	H02.01
15	Axis 1 Reverse Step	S	ON/OFF	OFF				DB000013	H02.01
16	Axis 2 Forward Step	S	ON/OFF	OFF				DB000012	H02.02
17	Axis 2 Reverse Step	S	ON/OFF	OFF				DB000013	H02.02
18	Axis 1 Step Moving Amount	S	XXXXXXXXXX	0000000000		–0214783648	2147483647	DL00010	H02.01
19	Axis 2 Step Moving Amount	S	XXXXXXXXXX	0000000000		–0214783648	2147483647	DL00010	H02.02

(2) Confirming Operation

Use the following procedure to confirm operation.

Turn ON the Servo.

↓

Start jog or step operation.

↓

Confirm operation.

The following table gives an outline of the operation when the Tuning Panel window is used.

Data Name	Tuning Panel Operation	Operation Outline
Servo ON PB	Current value OFF → ON	The Servomotor will turn ON and the Servo will be clamped.
	Current value ON → OFF	Servo turned OFF.
Axis 1 Forward Jog	Current value OFF → ON	Axis 1 rotates forward.
	Current value ON → OFF	Axis 1 stops.
Axis 1 Reverse Jog	Current value OFF → ON	Axis 1 rotates in reverse.
	Current value ON → OFF	Axis 1 stops.
Axis 2 Forward Jog	Current value OFF → ON	Axis 2 rotates forward.
	Current value ON → OFF	Axis 2 stops.
Axis 2 Reverse Jog	Current value OFF → ON	Axis 2 rotates in reverse.
	Current value ON → OFF	Axis 2 stops.
Axis 1 Forward Step	Current value OFF → ON	Axis 1 starts rotating forward for the moving amount set under Axis 1 Step Moving Amount.
	Current value ON → OFF	Axis 1 stops rotating. Input OFF after executing stepping.
Axis 1 Reverse Step	Current value OFF → ON	Axis 1 starts rotating in reverse for the moving amount set under Axis 1 Step Moving Amount.
	Current value ON → OFF	Axis 1 stops rotating. Input OFF after executing stepping.
Axis 2 Forward Step	Current value OFF → ON	Axis 2 starts rotating forward for the moving amount set under Axis 2 Step Moving Amount.
	Current value ON → OFF	Axis 2 stops rotating. Input OFF after executing stepping.
Axis 2 Reverse Step	Current value OFF → ON	Axis 2 starts rotating in reverse for the moving amount set under Axis 2 Step Moving Amount.
	Current value ON → OFF	Axis 2 stops rotating. Input OFF after executing stepping.
Axis 1 Step Moving Amount	Enter any value.	Sets the Step moving amount for axis 1.
Axis 2 Step Moving Amount	Enter any value.	Sets the Step moving amount for axis 2.

INFO

■ Actual Application Programs

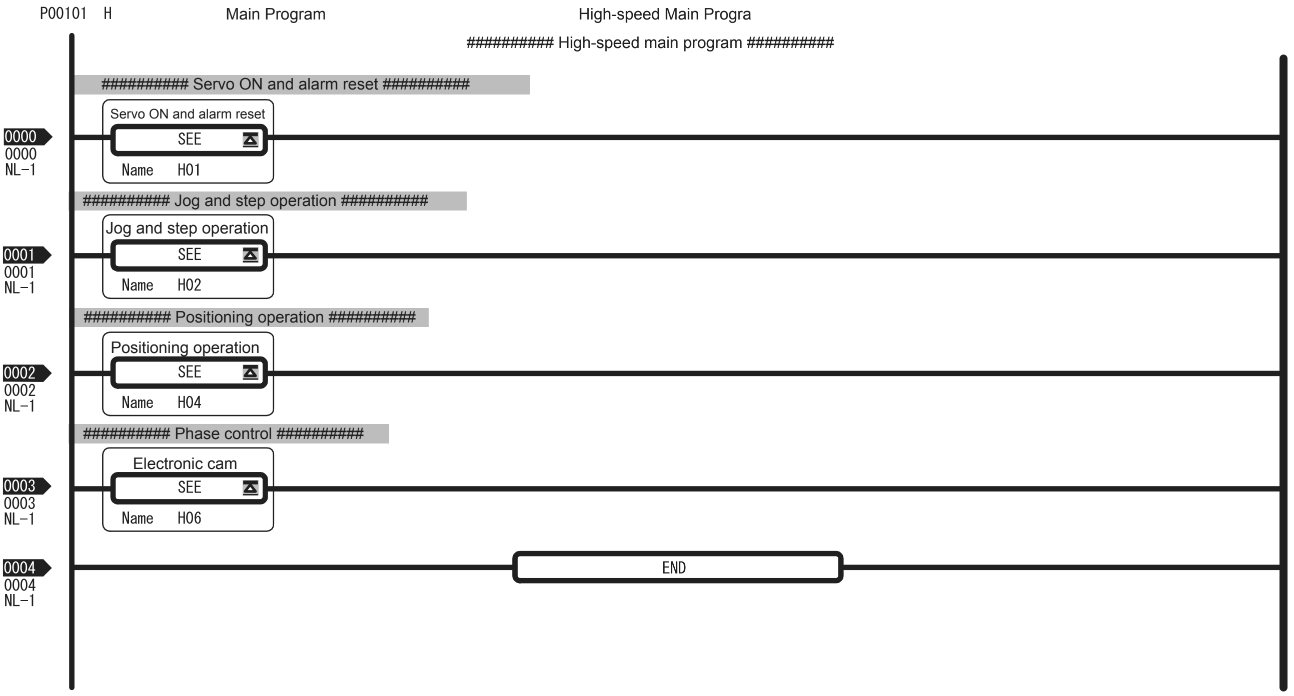
Programs must be created in actual applications to monitor and control registers that correspond to the signals and data listed above.

The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under REG-No. next to DWG at the right of the Tuning Panel window.

3.2.3 Program Details

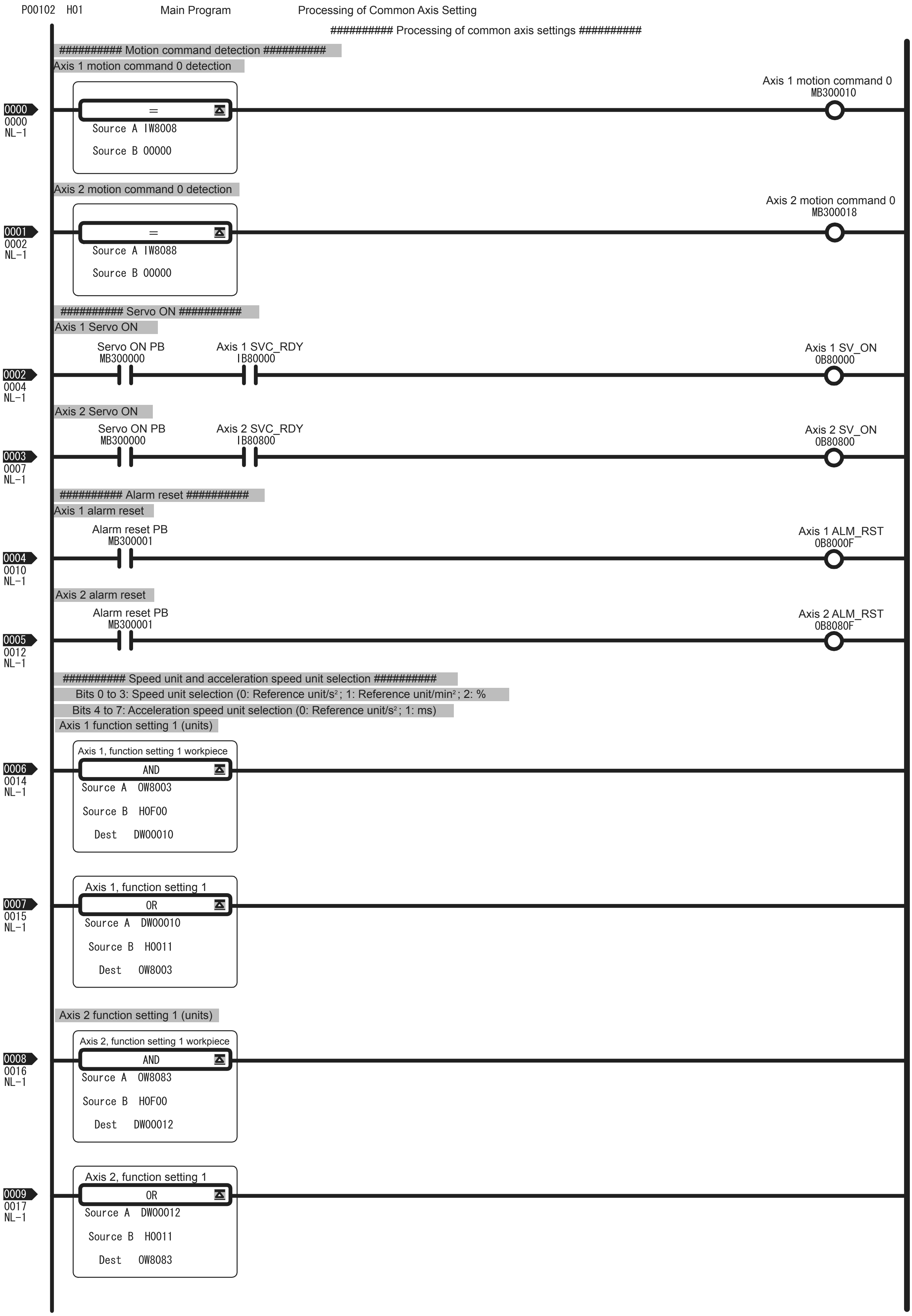
(1) H Drawing

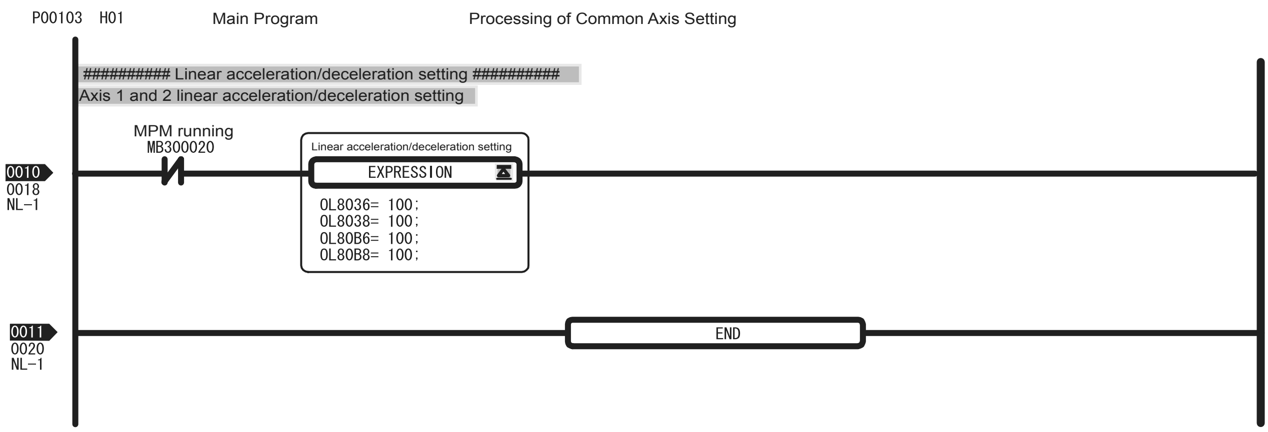
The H parent drawing controls the overall sample program.



(2) H01 Drawing

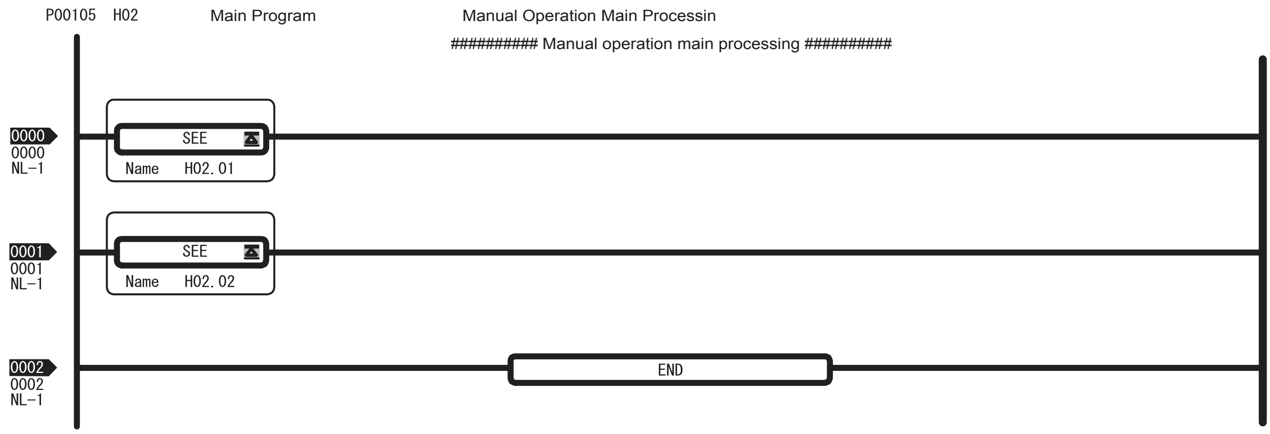
The H01 child drawing turns ON the Servo, resets alarms, and sets common parameters.





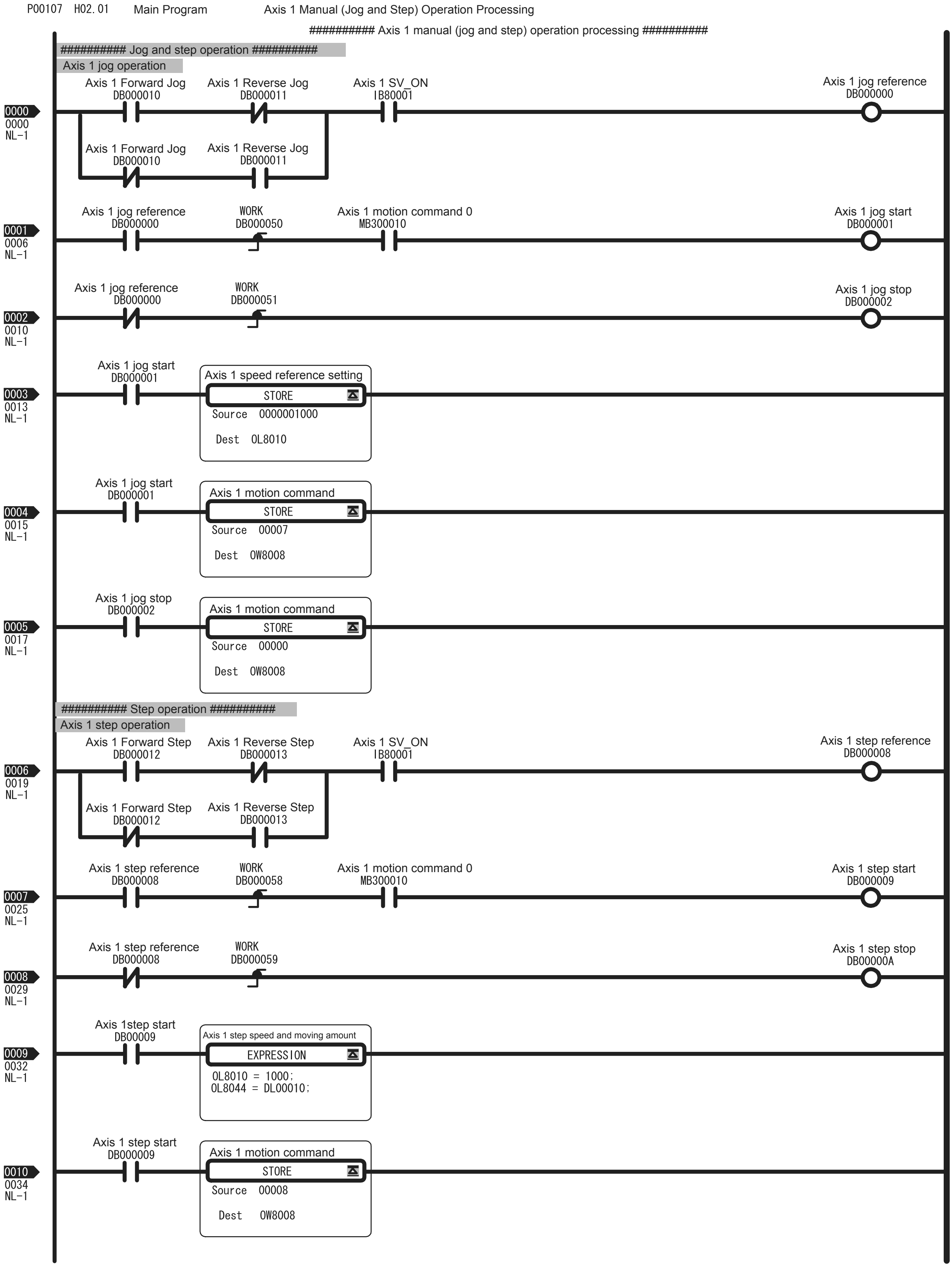
(3) H02 Drawing

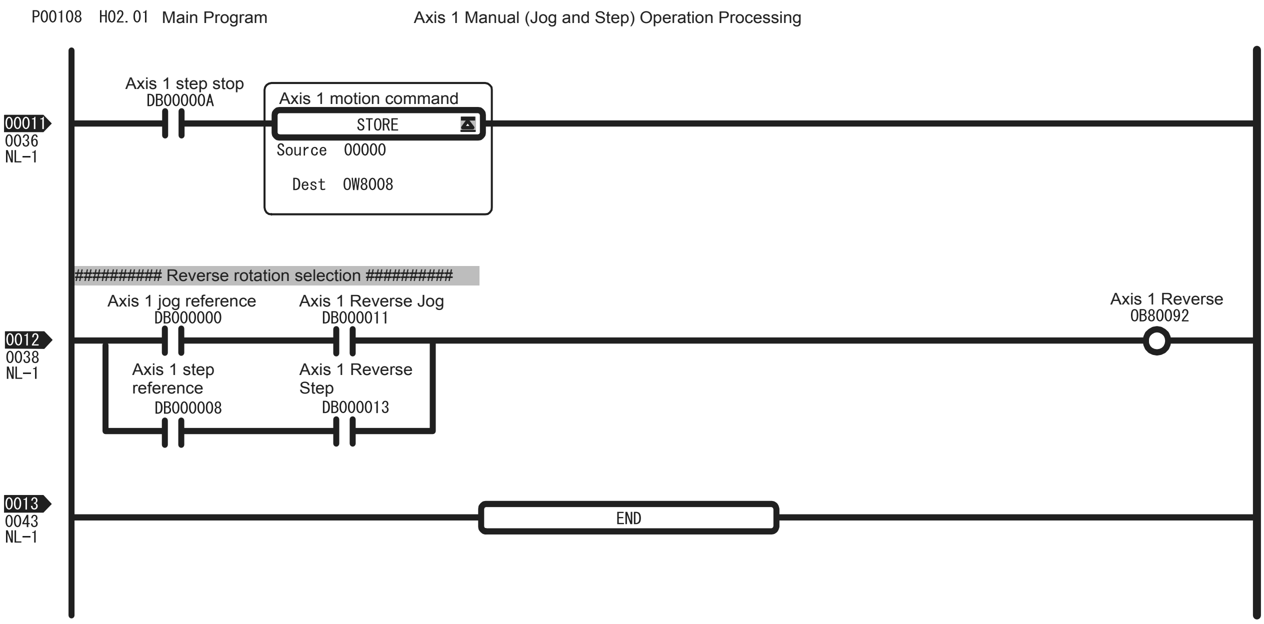
The H02 child drawing controls jog and step operation.



(4) H02.01 Drawing

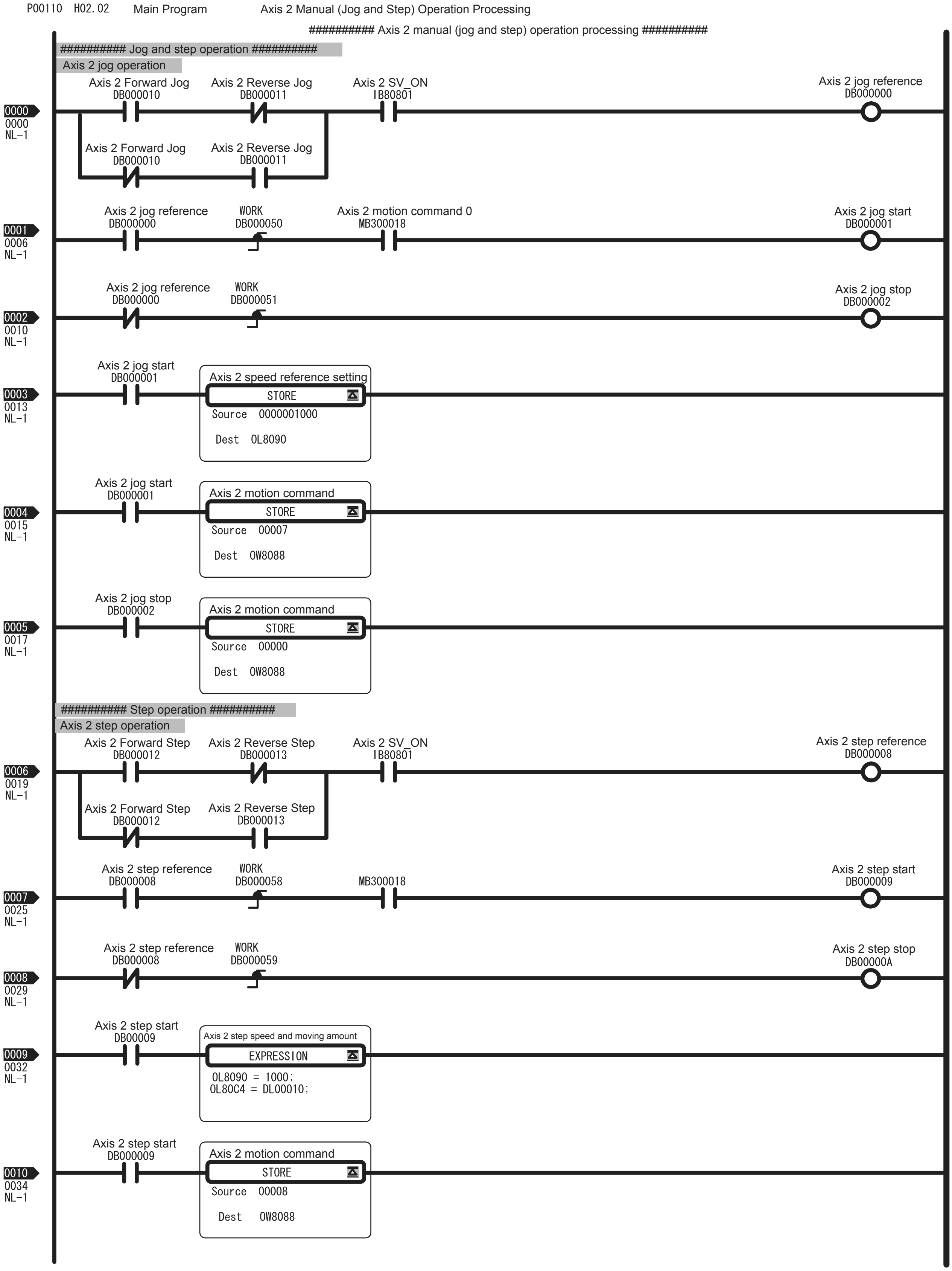
The H02.01 grandchild drawing controls jog and step operation for axis 1.

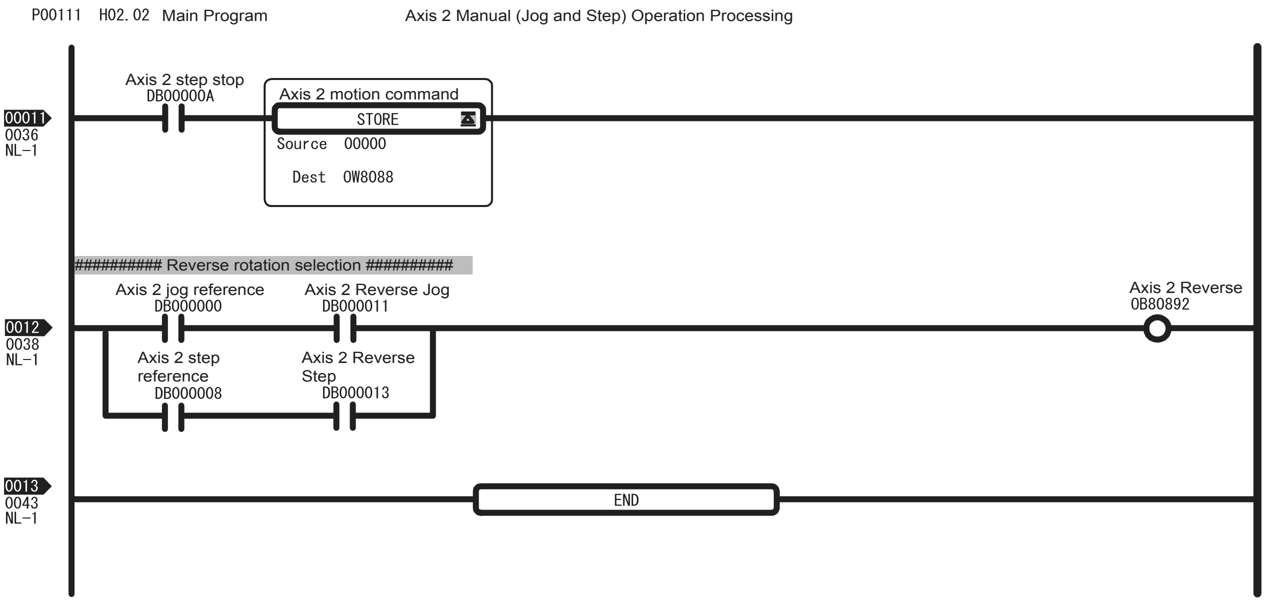



P00108 H02.01 Main Program
Axis 1 Manual (Jog and Step) Operation Processing
00011
0036
NL-1
Axis 1 step stop
DB00000A
Axis 1 motion command
STORE
Source 00000
Dest OW8008
########## Reverse rotation selection ##########
0012
0038
NL-1
Axis 1 jog reference
DB000000
Axis 1 Reverse Jog
DB000011
Axis 1 step reference
DB000008
Axis 1 Reverse Step
DB000013
Axis 1 Reverse
OB80092
0013
0043
NL-1
END

(5) H02.02 Drawing

The H02.02 grandchild drawing controls jog and step operation for axis 2.



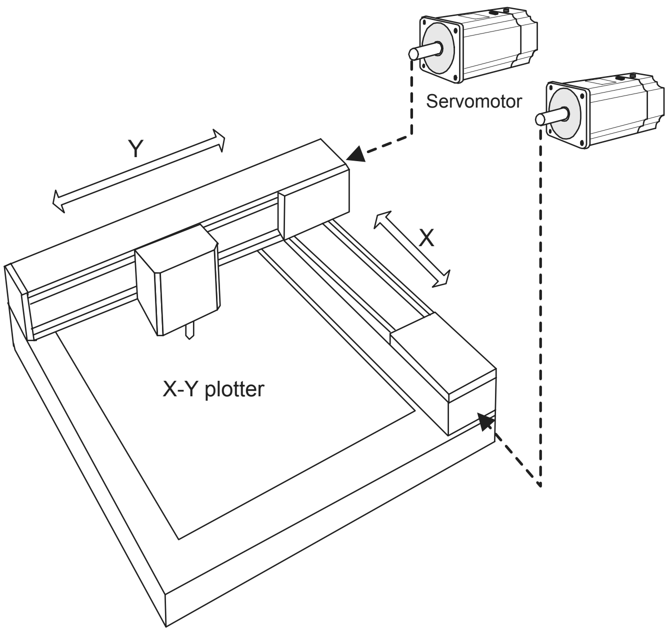

P00111 H02.02 Main Program
Axis 2 Manual (Jog and Step) Operation Processing
Axis 2 step stop
DB00000A
Axis 2 motion command
STORE
Source 00000
Dest OW8088
00011
0036
NL-1
########## Reverse rotation selection ##########
Axis 2 jog reference
DB000000
Axis 2 Reverse Jog
DB000011
Axis 2 Reverse
OB80892
0012
0038
NL-1
Axis 2 step reference
DB000008
Axis 2 Reverse Step
DB000013
0013
0043
NL-1
END

3.3 Sample Program 2: Positioning Control

3.3.1 Description

(1) Machine Outline

Sample program 2 will use a motion program to operate a hypothetical X-Y plotter, such as the one in the following diagram.



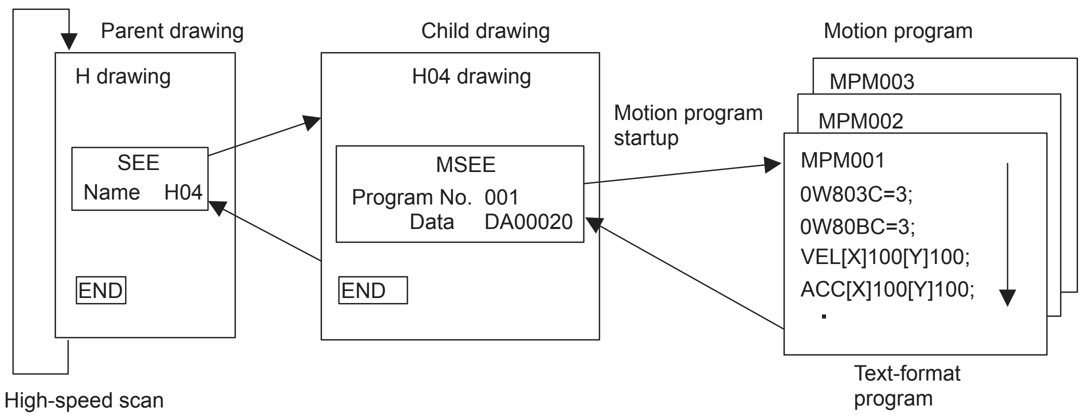
(2) Program Outline

- The H04 drawing (ladder program) starts a text-format motion program.
- The motion program executes the commands and operations in the program in order from the beginning.

The following sample motion programs have been prepared.

- Motion program No. 1 (MPM001): Zero point return operation using phase-C pulse
- Motion program No. 2 (MPM002): 2-axis positioning and interpolation
- Motion program No. 3 (MPM003): 2-axis positioning and interpolation

Refer to *3.3.3 Program Details* for details on the sample program.



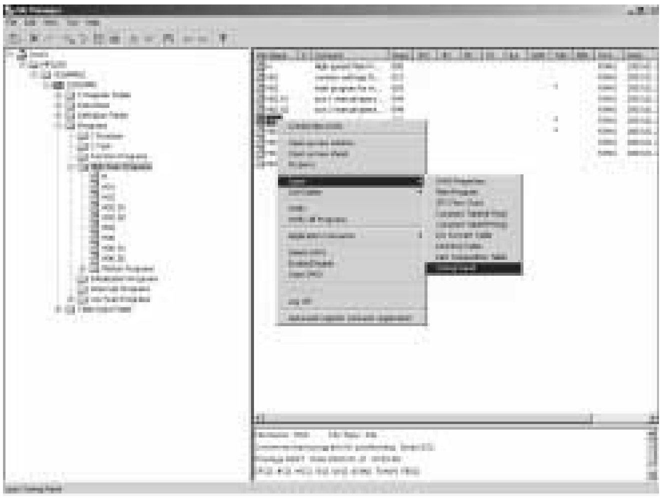
IMPORTANT

- This program is solely for the purpose of describing the MP2200 system startup. Care must be taken because actual applications will differ.
- This program has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual applications.

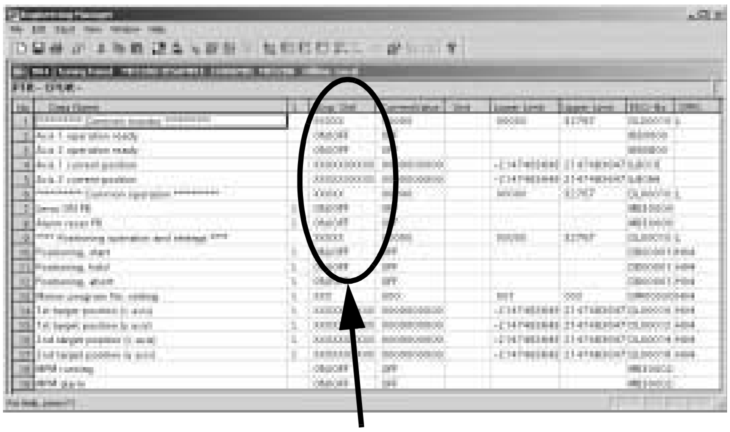
3.3.2 Operation

(1) Tuning Panel

1. Use the Tuning Panel Window for the H04 drawing to check operations, just as described in *3.2.2 Operation*. Right-click the H04 drawing in the High Scan Programs Folder and select ***Open - Tuning Panel***.



2. The Tuning Panel Window for the H04 drawing will be displayed.



The details on the Tuning Panel Window display are shown in the following table.

No.	Data Name	S	Display Definition	Current Value	Units	Lower Limit	Upper Limit	REG-No.	DWG
1	***************Common monitor***************		XXXXX	00000		00000	32767	DL00010	L
2	Axis 1 operation ready		ON/OFF	ON				IB80000	
3	Axis 2 operation ready		ON/OFF	ON				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8096	
6	***************Common operation***************		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	OFF				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	*********Positioning operation and settings*********		XXXXX	00000		00000	32767	DW00010	L
10	Start positioning	S	ON/OFF	OFF				DB000010	H04
11	Hold positioning	S	ON/OFF	OFF				DB000011	H04
12	Abort positioning	S	ON/OFF	OFF				DB000010	H04
13	Motion program No. setting	S	XXX	001		001	003	DW00030	H04
14	1st target position (X axis)	S	XXXXXXXXXX	0000010000		–2147483648	2147483647	DL00010	H04
15	1st target position (Y axis)	S	XXXXXXXXXX	0000020000		–2147483648	2147483647	DL00012	H04
16	2nd target position (X axis)	S	XXXXXXXXXX	0000040000		–2147483648	2147483647	DL00014	H04
17	2nd target position (Y axis)	S	XXXXXXXXXX	0000060000		–2147483648	2147483647	DL00016	H04
18	MPM running		ON/OFF	OFF				MB300020	
19	MPM alarm		ON/OFF	OFF				MB300028	

(2) Confirming Operation

Use the following procedure to confirm operation.

Turn ON the Servo.
↓
Input motion program number setting.
↓
Enter target value for each axis.
↓
Positioning starts.
↓
Confirm motion program operation.

The process for confirming operation will be explained based on the above flowchart.

1. Switching between Servo ON and Servo OFF

   Change the current value setting for Servo ON PB from OFF to ON on the Tuning Panel Window. The Servomotor will turn ON and the Servo will be clamped.

2. Setting Motion Program Number

   Change the current value setting for Motion Program No. Setting to a value between 1 and 3 on the Tuning Panel Window. This sets the motion program number that will be executed. No programs have been created for numbers 4 onwards, so an MPM alarm will occur if a number other than 1 to 3 is entered.

3. Entering Target Values for Each Axis

   Enter any value for the current value for the items listed below. The values entered here will be the positioning target values when motion program numbers 2 and 3 are executed.

   - 1st target value (X axis)
   - 1st target value (Y axis)
   - 2nd target value (X axis)
   - 2nd target value (Y axis)

4. Starting Positioning

   Set the current value for Start Positioning to ON on the Tuning Panel Window. Positioning will start based on the motion program number set earlier (MPM No.). After positioning has been executed, change the current value to OFF.

5. Confirming Motion Program Operation

   When a motion program is started, the current value for MPM Running on the Tuning Panel Window will change to ON. And when the Servo axis rotates, the values for the current position on the Tuning Panel Window change.

IMPORTANT

If an error occurs during execution of a motion program, the current value for MPM Alarm on the Tuning Panel Window will change to ON. Use the following procedure to clear the alarm.

1. Change the current value for Abort of Positioning to ON and then to OFF.
2. Change the current value for Alarm Reset PB to ON and then to OFF.

INFO

■ Actual Application Programs

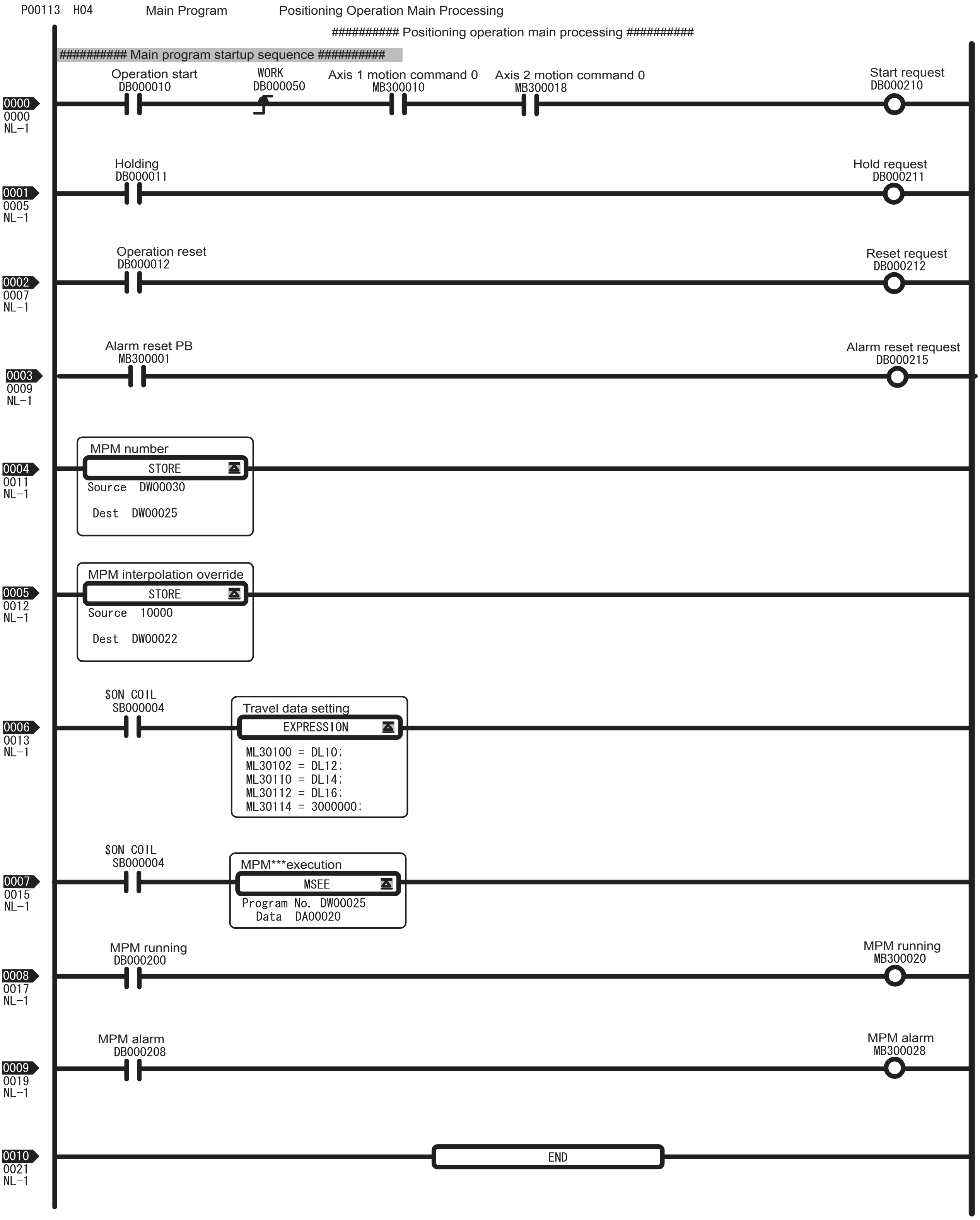
Programs must be created in actual applications to monitor and control registers that correspond to the signals and data listed above.

The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under REG-No. next to DWG at the right of the Tuning Panel window.

3.3.3 Program Details

(1) H04 drawing

The H04 child drawing manages and controls motion programs (MPM programs).



(2) Motion Program MPM001

Motion program MPM001 is a text-format program that is started by the MSEE instruction (motion program call instruction) in the H04 drawing.

◀ EXAMPLE ▶

In this example, the motion program MPM001 performs a zero point return using the phase-C pulse.

YESAMPLE PRG. MPM001 MP text

```
"MPM001";
OW803C=3;                  "X Axis zero point return method(3: phase-C)"
OW80BC=3;                  "Y Axis zero point return method(3: phase-C)"
VEL [X]1000 [Y]1000;       "Travel speed for positioning command"
ACC[X]100[Y]100;           "Acceleration time"
DCC[X]100[Y]100;           "Deceleration time"
OW803E=100;                "X Axis approach speed(mm/min)"
OW8040=50;                 "X Axis creep speed(mm/min)"
OL8042=10000;              "X Axis final travel distance(0.001mm)"
OW80BE=100;                "Y Axis approach speed(mm/min)"
OW80C0=50;                 "Y Axis creep speed(mm/min)"
OL80C2=10000;              "Y Axis final travel distance(0.001mm)"
ZRN[X]00[Y]00;             "Zero point return command"
END;
```


(3) Motion Programs MPM002 and MPM003

Motion programs MPM002 and MPM003 are text-format programs that are started by the MSEE instruction (motion program call instruction) in the H04 drawing.

◀ EXAMPLE ▶

In this example, motion programs MPM002 and MPM003 perform 2-axis positioning and interpolation. MPM002 has timer commands in between each travel command to provide clear delimits for each operation. MPM003 is MPM002 without the timer commands, so that the travel commands are executed continuously.

YESAMPLE PRG. MPM002 MP text

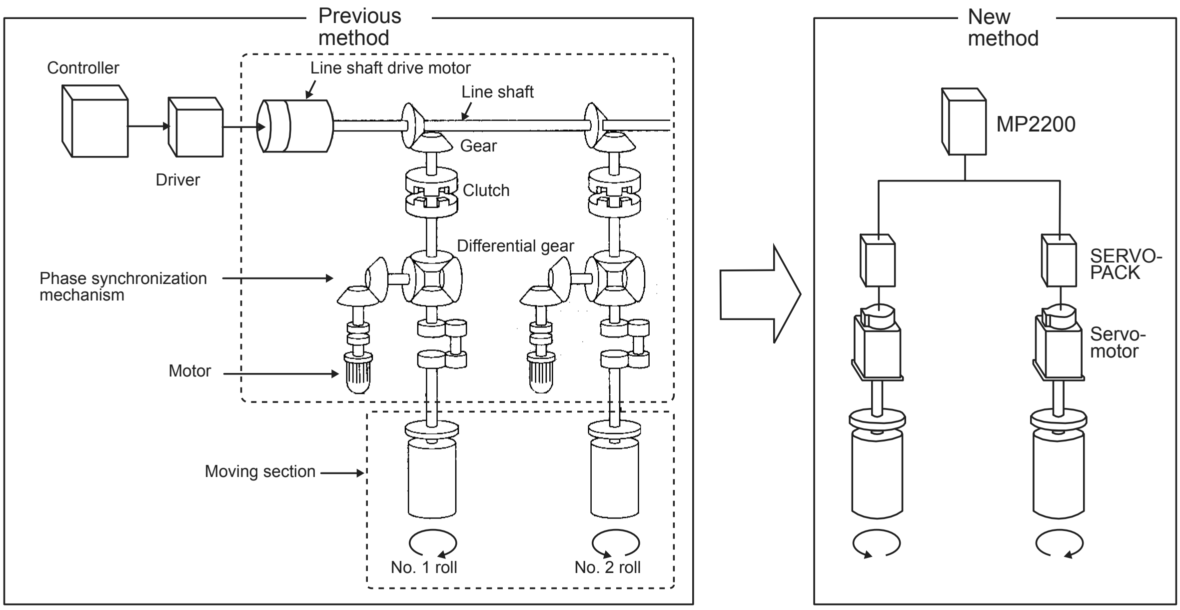
```
"MPM002";
"**** Data settings *****";
VEL [X]1000 [Y]1000;              "Travel speed for positioning command"
FMX T50000000;                    "Composite speed upper limit for interpolation Command"
IAC T500;                                   "Acceleration time for interpolation"
IDC T500;                                   "Deceleration time for interpolation"
PLN [X][Y];                       "Plane setting for circular interpolation"
INC;                              "Increamental mode"
TIM T100;
"***** repeat operation *****";
DW10 =0;
WHILE DW10 <5;                    "number of repeats = 5 "
MOV [X]ML30100 [Y]ML30102 ;       "Positioning command"
TIM T100;
MVS [X]ML30110 [Y]ML30112 FML30114;   "Linear Interpolation "
TIM T100;
ABS;                              "Absolute mode"
MCC [X]0 [Y]0 R1000.0 FML30114;   "Circular Interpolation "
TIM T100;
DW10 =DW10 +1;
WEND;
"**** repeat operation end *****";
END;
```

3.4 Sample Program 3: Phase Control with an Electronic Shaft

3.4.1 Description

(1) Machine Outline

The same operation for the No. 1 and No. 2 rolls connected to the line shaft is performed using a Servomotor. Phase synchronization, however, has not been used.

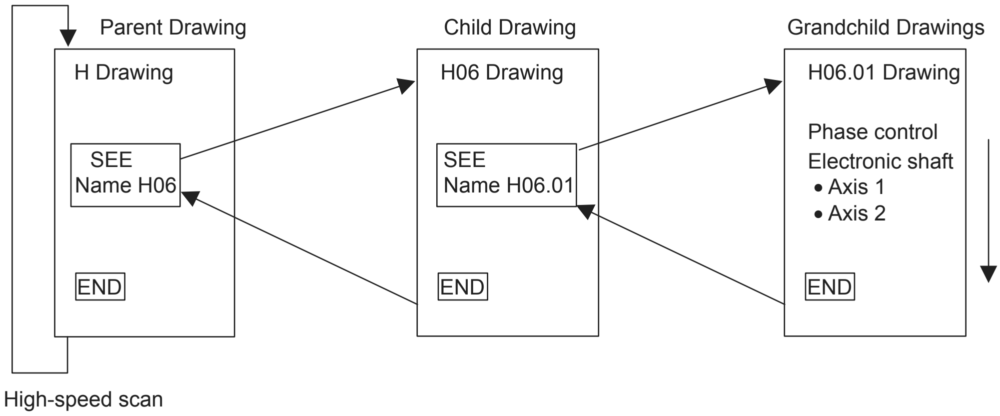


(2) Program Outline

- The H06.01 drawing (ladder program) controls the operation.
- The two axes rotate synchronously according to the entered speed settings.
- The following gear ratio is set in this example.

Axis 1 (No. 1 roll): Axis 2 (No. 2 roll) = 1:1

Refer to *3.4.3 Program Details* for details on the sample program.



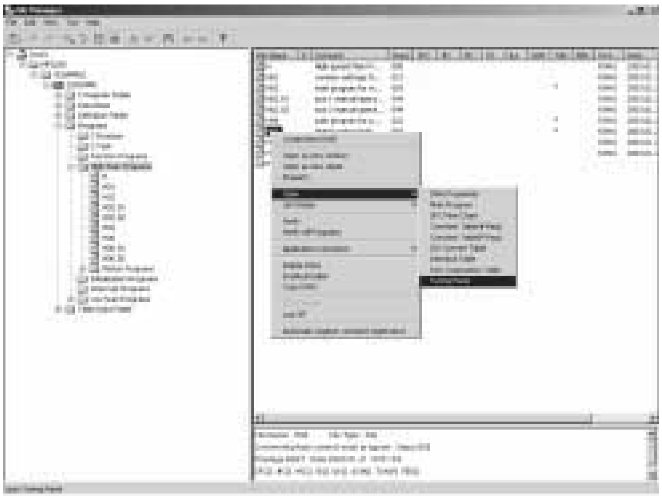
IMPORTANT

- This program is solely for the purpose of describing the MP2200 system startup. Care must be taken because actual applications will differ.
- This program has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual applications.

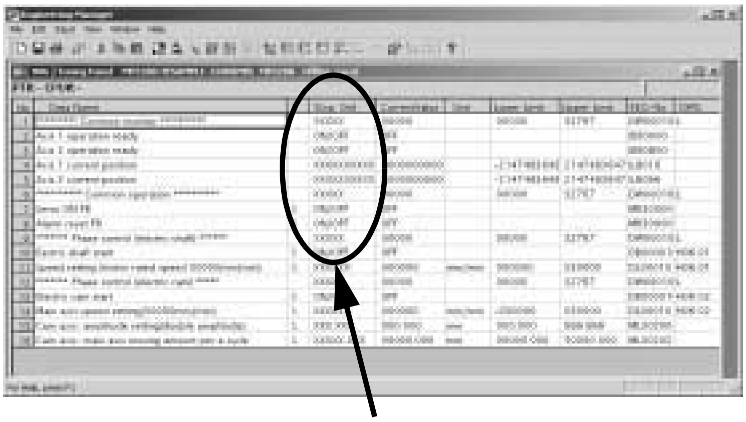
3.4.2 Operation

(1) Tuning Panel

1. Use the Tuning Panel Window for the H06 drawing to check operations, just as described in *3.2.2 Operation*. Right-click the H06 drawing in the High Scan Programs Folder and select ***Open - Tuning Panel***.



2. The Tuning Panel Window for the H06 drawing will be displayed.



Input position and current value.

The details on the Tuning Panel Window display are shown in the following table.

No.	Data Name	S	Display Definition	Current Value	Units	Lower Limit	Upper Limit	REG-No.	DWG
1	***************Common monitor***************		XXXXX	00000		00000	32767	DW00010	L
2	Axis 1 operation ready		ON/OFF	ON				IB80000	
3	Axis 2 operation ready		ON/OFF	ON				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8096	
6	***************Common operation***************		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	OFF				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	*************Phase control (Electronic shaft)*************		XXXXX	00000		00000	32767	DW00010	L
10	Electronic shaft start	S	ON/OFF	OFF				DB000010	H06.01
11	Speed setting (motor rated speed: 30000 mm/min)	S	XXXXXX	000000	mm/min	–030000	030000	DL00010	H06.02
12	*************Phase control (Electronic cam)*************		XXXXX	0000		0000	32767	DW00010	L
13	Electronic cam start	S	ON/OFF	OFF				DB000010	H06.02
14	Main axis speed setting (motor rated speed: 30000 mm/min)	S	XXXXXX	00000	mm/min	00000	030000	DL00010	H06.01
15	Cam axis: amplitude setting (double amplitude)	S	XXX.XXX	010.000	mm	000.000	999.999	ML30200	
16	Cam axis: main axis moving amount per cycle	S	XXXXX.XXX	00500.000	mm	00000.000	50000.000	ML30202	

(2) Confirming Operation

Use the following procedure to confirm operation.

Turn ON the Servo.
↓
Start the electronic shaft.
↓
Enter speed settings.
↓
Confirm operation.

The process for confirming operation will be explained based on the above procedure.

1. Switching between Servo ON and Servo OFF

   Change the current value setting for Servo ON PB from OFF to ON on the Tuning Panel Window. The Servomotor will turn ON and the Servo will be clamped.

2. Starting the Electronic Shaft

   Change the current value for Electronic Shaft Start to ON in the Tuning Panel Window. The mode will change to Phase Control (Electronic Shaft) Mode. Change the current value to OFF to exit Phase Control (Electronic Shaft) Mode.

3. Entering Speed Settings

   Change the current value for the Speed Setting (Motor Rated Speed) in the Tuning Panel Window to any value between 0 and 30000. The value set will be the synchronous speed for both axes and the axes will start rotating.

INFO

■ Actual Application Programs

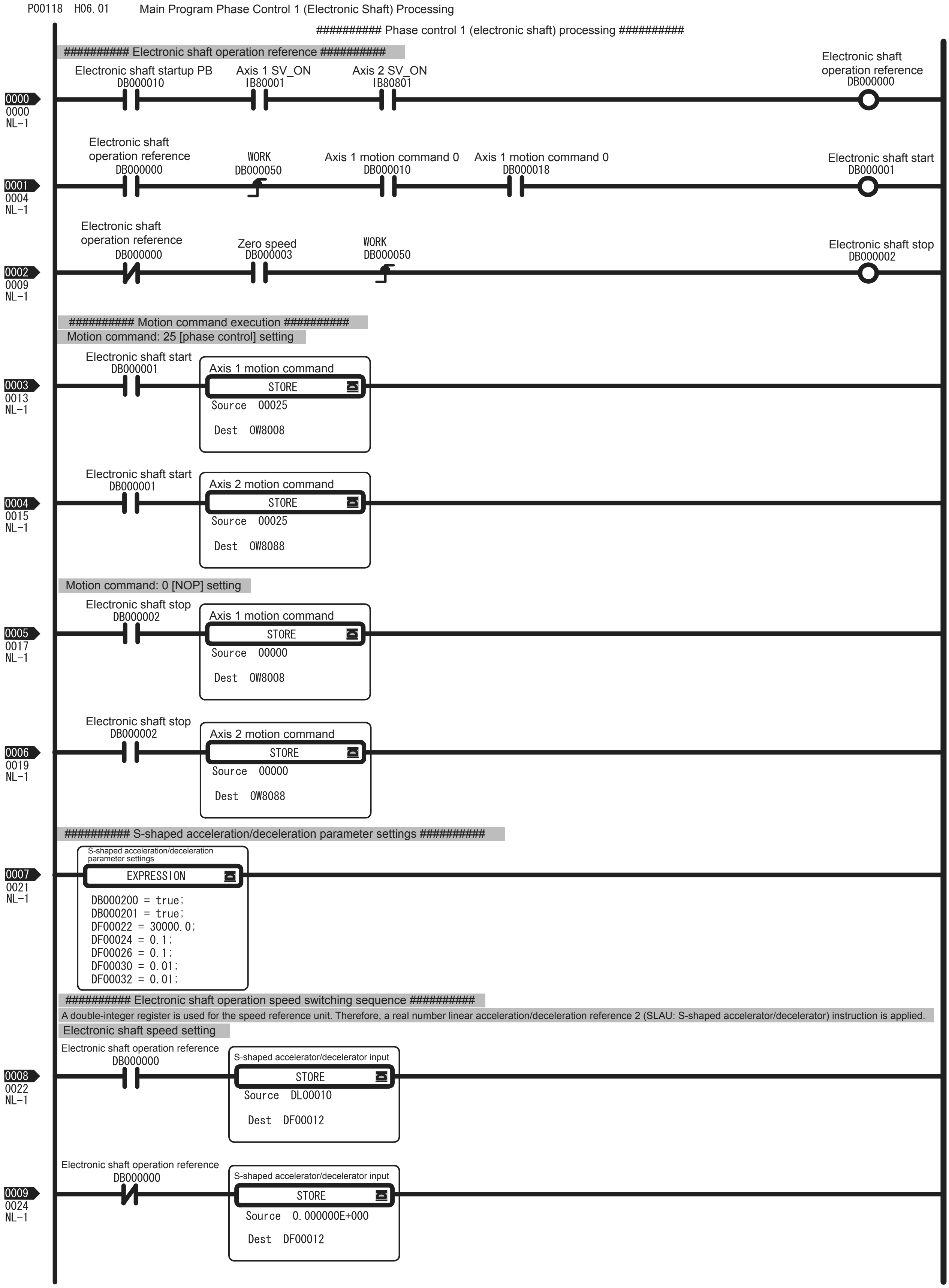
Programs must be created in actual applications to monitor and control registers that correspond to the signals and data listed above.

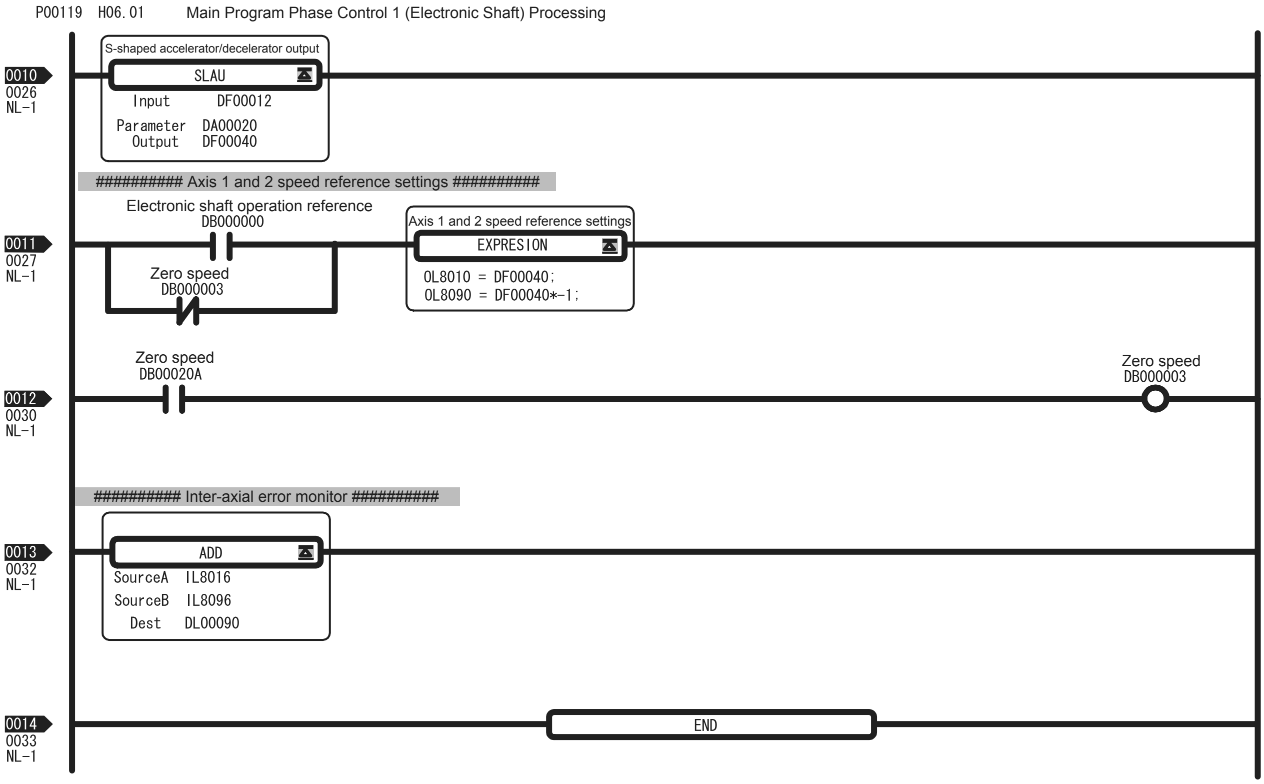
The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under REG-No. next to DWG at the right of the Tuning Panel window.

3.4.3 Program Details

(1) H06.01 Drawing

The H06.01 grandchild drawing controls phase control (electronic shaft) operation.



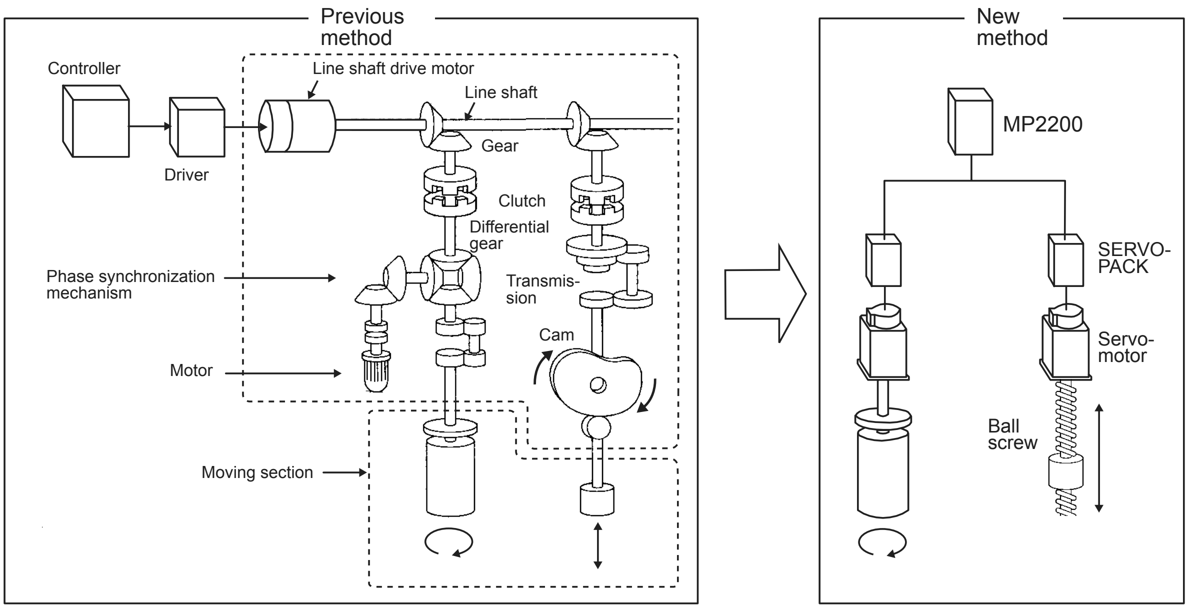

P00119 H06.01
Main Program Phase Control 1 (Electronic Shaft) Processing
0010
0026
NL-1
S-shaped accelerator/decelerator output
SLAU
Input DF00012
Parameter DA00020
Output DF00040
########## Axis 1 and 2 speed reference settings ##########
0011
0027
NL-1
Electronic shaft operation reference
DB000000
Zero speed
DB000003
Axis 1 and 2 speed reference settings
EXPRESION
OL8010 = DF00040;
OL8090 = DF00040*-1;
0012
0030
NL-1
Zero speed
DB00020A
Zero speed
DB000003
########## Inter-axial error monitor ##########
0013
0032
NL-1
ADD
SourceA IL8016
SourceB IL8096
Dest DL00090
0014
0033
NL-1
END

3.5 Sample Program 4: Phase Control with an Electronic Cam

3.5.1 Description

(1) Machine Outline

The same operation for the mechanical cam synchronized to the roller connected to the line shaft will be performed using a Servomotor. Phase synchronization, however, has not been used.



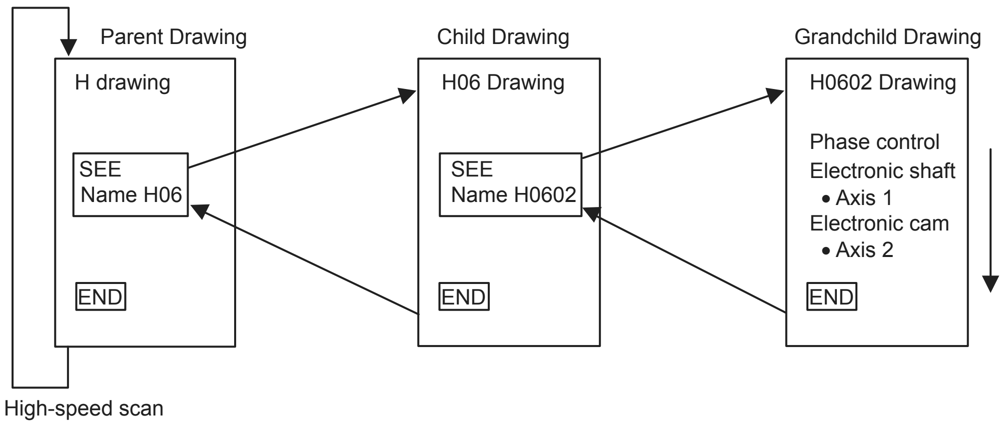
(2) Program Outline

- The H06.02 drawing (ladder program) controls the operation.
- The two axes rotate synchronously according to the entered speed settings.
- The following configuration is used in this example.

Axis 1: Roller axis = Master axis 2: Cam axis = Slave axis. Performs cosine cam pattern operation in reference to the master axis.

- Cam pattern data is generated by the L06 drawing (ladder program).

Refer to *3.5.3 Program Details* for details on the sample program.



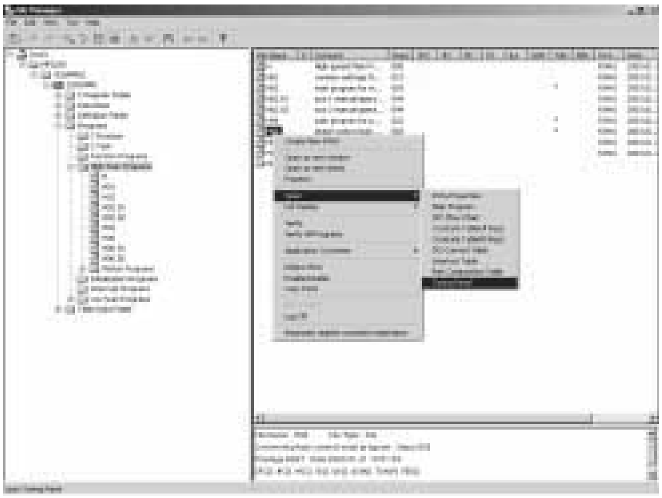
IMPORTANT

- This program is solely for the purpose of describing the MP2200 system startup. Care must be taken because actual applications will differ.
- This program has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual applications.

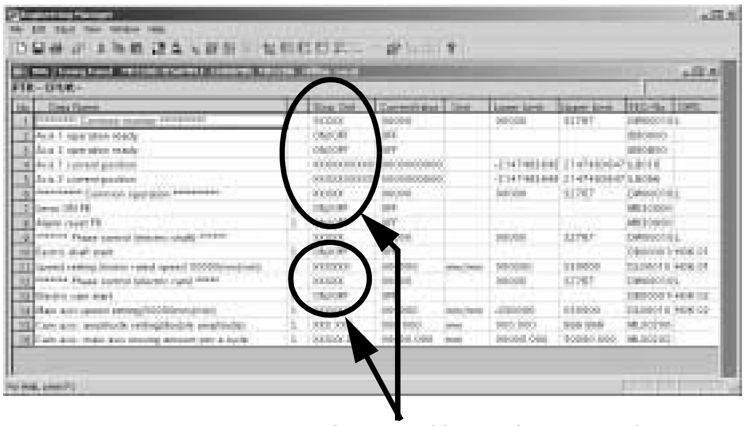
3.5.2 Operation

(1) Tuning Panel

1. Use the Tuning Panel Window for the H06 drawing to check operations, just as described in *3.4.2 Operation*. Right-click the H06 drawing in the High Scan Programs Folder and select ***Open - Tuning Panel***.



2. The Tuning Panel Window for the H06 drawing will be displayed.



The details on the Tuning Panel Window display are shown in the following table.

No.	Data Name	S	Display Definition	Current Value	Units	Lower Limit	Upper Limit	REG-No.	DWG
1	***************Common monitor***************		XXXXX	00000		00000	32767	DW00010	L
2	Axis 1 operation ready		ON/OFF	ON				IB80000	
3	Axis 2 operation ready		ON/OFF	ON				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		–2147483648	2147483647	IL8096	
6	***************Common operation***************		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	OFF				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	************Phase control (electronic shaft))************		XXXXX	00000		00000	32767	DW00010	L
10	Electronic shaft start	S	ON/OFF	OFF				DB000010	H06.01
11	Speed setting (motor rated speed: 30000 mm/min)	S	XXXXXX	000000	mm/min	–030000	030000	DL00010	H06.02
12	*************Phase control (electronic cam)*************		XXXXX	0000		0000	32767	DW00010	L
13	Electronic cam start	S	ON/OFF	OFF				DB000010	H06.02
14	Main axis speed setting (motor rated speed: 30000 mm/min)	S	XXXXXX	00000	mm/min	00000	030000	DL00010	H06.01
15	Cam axis: amplitude setting (double amplitude)	S	XXX.XXX	010.000	mm	000.000	999.999	ML30200	
16	Cam axis: main axis moving amount per cycle	S	XXXXX.XXX	00500.000	mm	00000.000	50000.000	ML30202	

(2) Confirming Operation

Use the following procedure to confirm operation.

Turn ON the Servo.
↓
Enter electronic cam settings data.
↓
Turn ON electronic cam start.
↓
Enter main axis speed settings.
↓
Confirm operation.

The process for confirming operation will be explained based on the above procedure.

1. Switching between Servo ON and Servo OFF

   Change the current value setting for Servo ON PB from OFF to ON on the Tuning Panel Window. The Servomotor will turn ON and the Servo will be clamped.

2. Entering Cam Data

   Enter any value within the setting range for the Tuning Panel Window items listed below. The cam pattern is generated from these settings. Cam pattern data is not changed, however, if the Electronic Cam Start (described next) is set to ON.

   - Cam axis amplitude setting (double amplitude) . . . . . Setting range: 0 to 999.999
   - Cam axis main axis moving amount for one cycle . . . Setting range: 0 to 50000.000

3. Starting Electronic Cam Operation

   Change the current value for Electronic Cam Start to ON in the Tuning Panel Window. The second axis will enter Phase Control (Electronic Cam) Mode. Change the current value to OFF to exit the Phase Control (Electronic Cam) Mode.

4. Entering Main Axis Speed Settings

   Change the current value for the Main Axis Speed Setting in the Tuning Panel Window to any value between –30000 to 30000. The value set will be the master axis speed and the axis operation will start.

INFO

■ Actual Application Programs

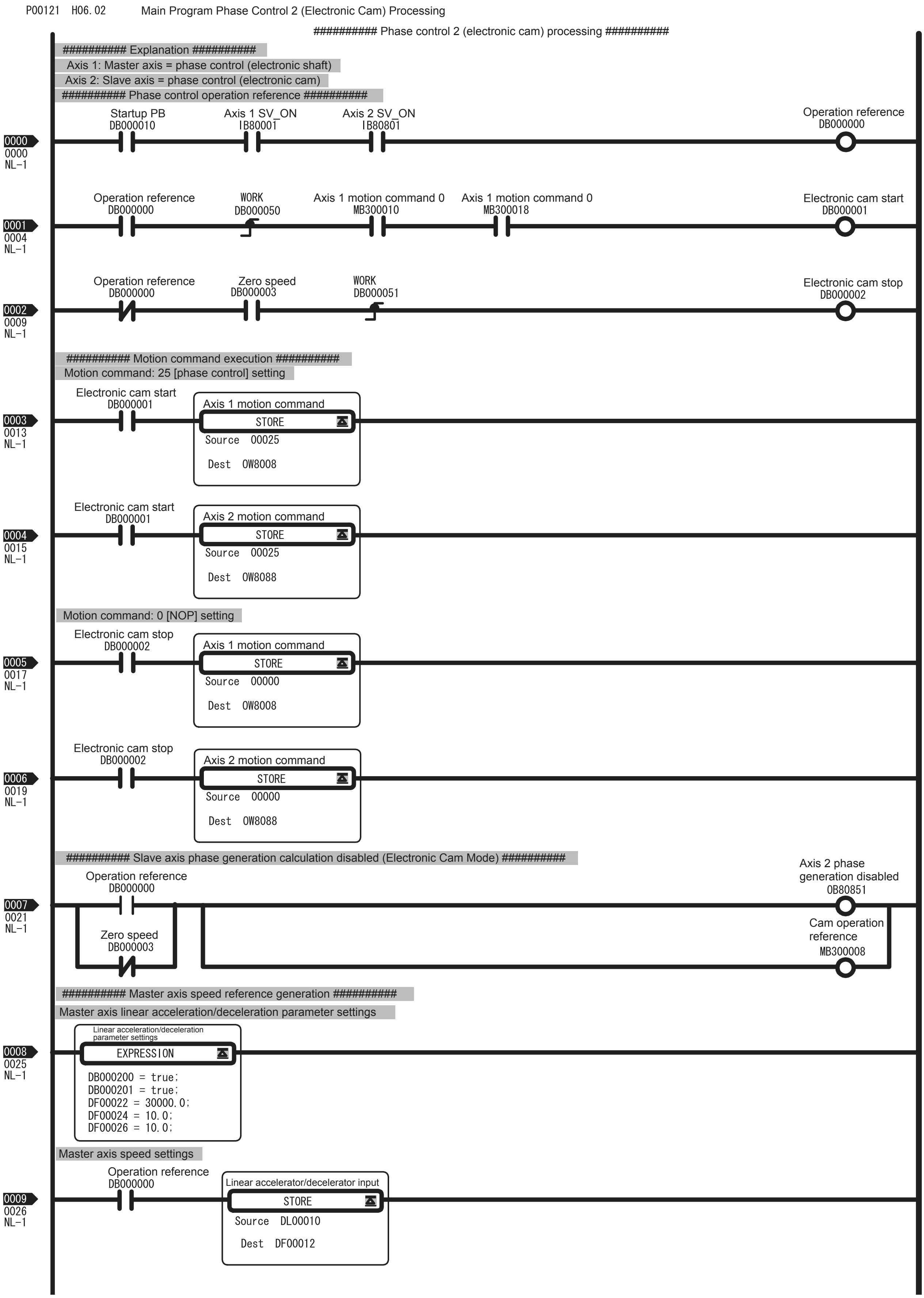
Programs must be created in actual applications to monitor and control registers that correspond to the signals and data listed above.

The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under REG-No. next to DWG at the right of the Tuning Panel window.

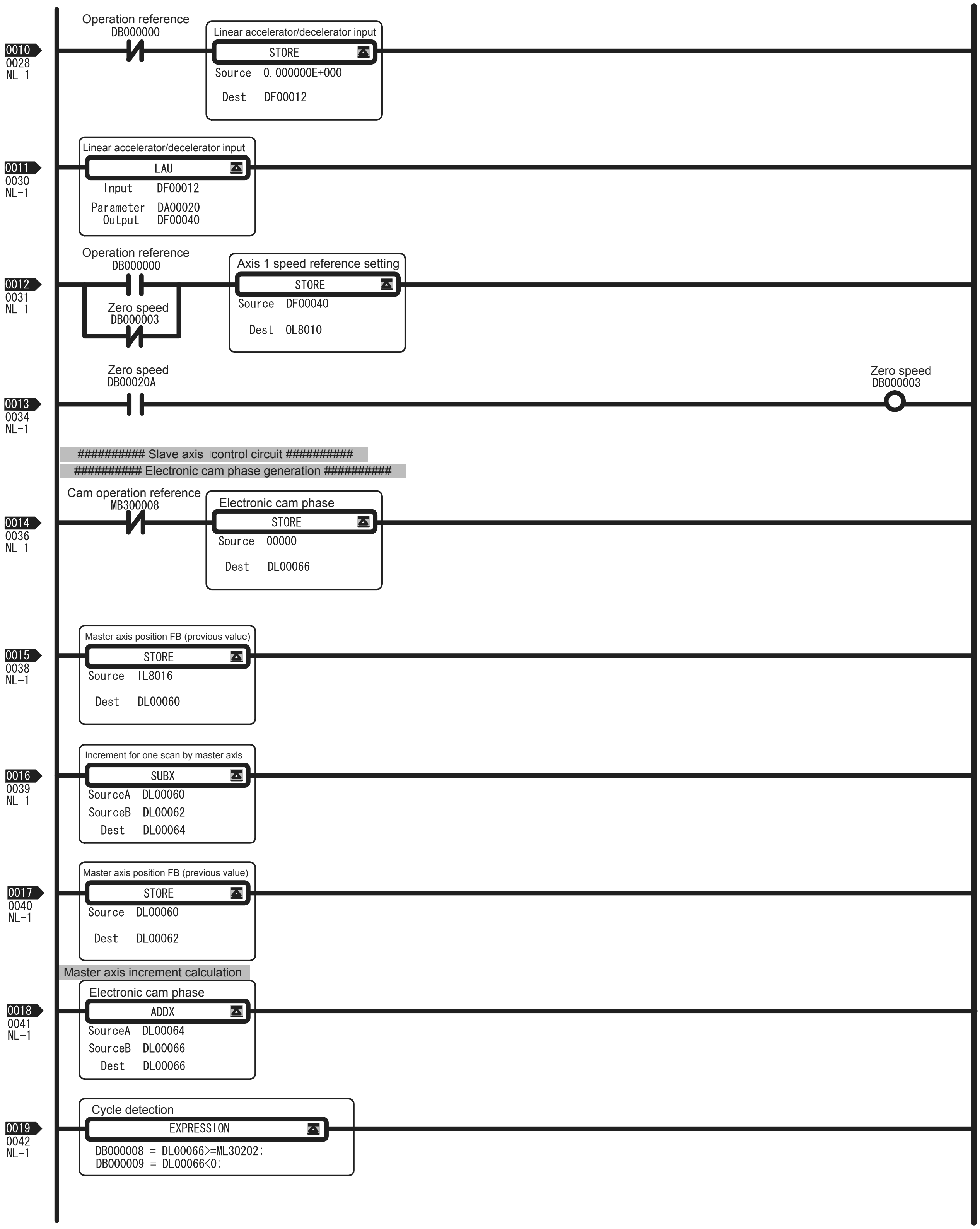
3.5.3 Program Details

(1) H06.02 Drawing

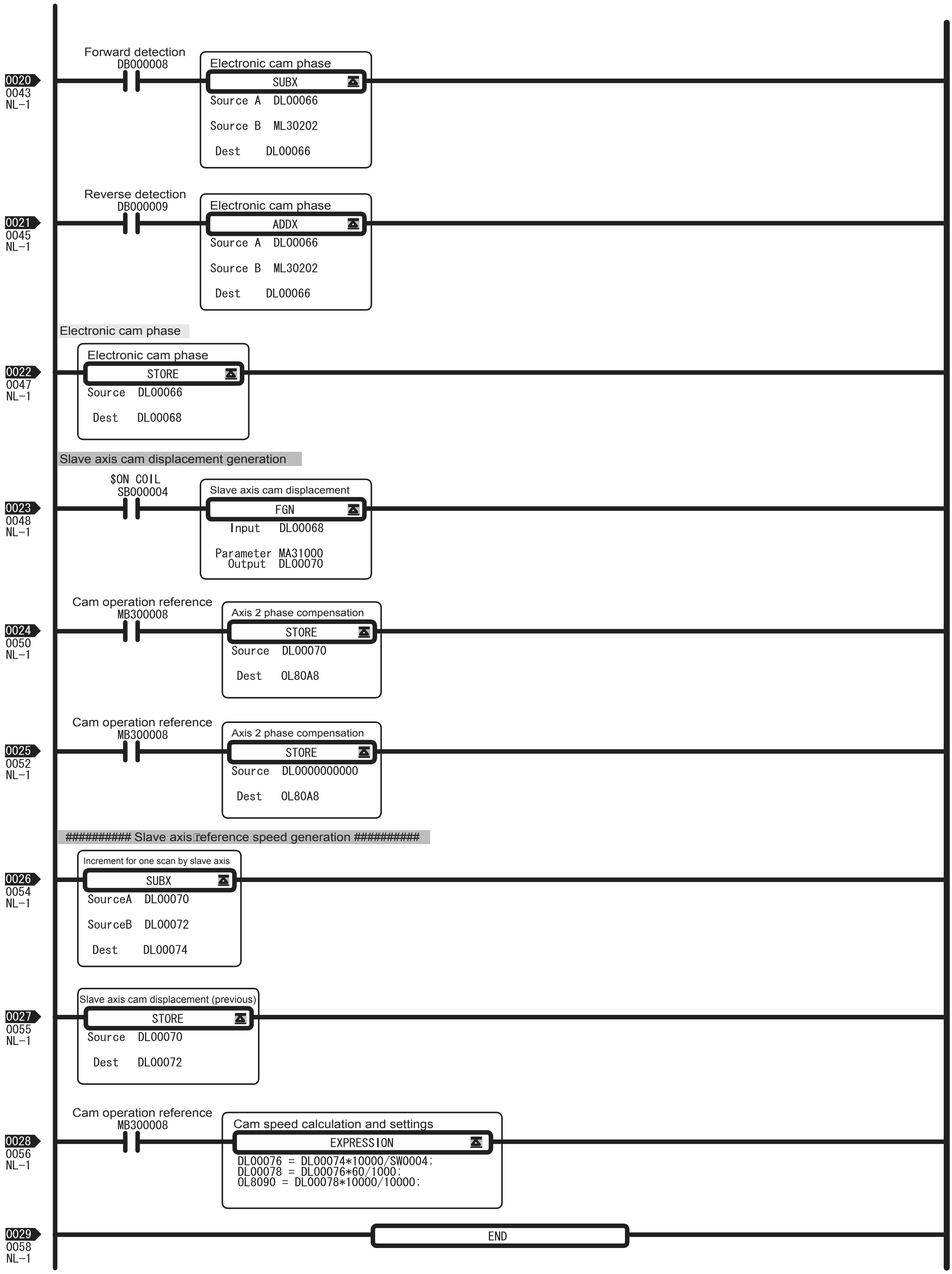
The H06.02 grandchild drawing controls phase control (electronic cam) operation.



P00122 H06.02 Main Program Phase Control 2 (Electronic Cam) Processing

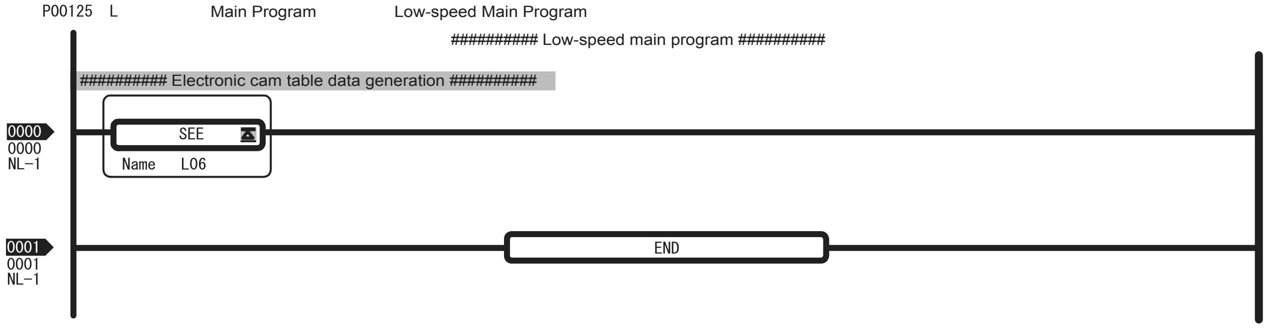


P00123 H06.02 Main Program Phase Control 2 (Electronic Cam) Processing



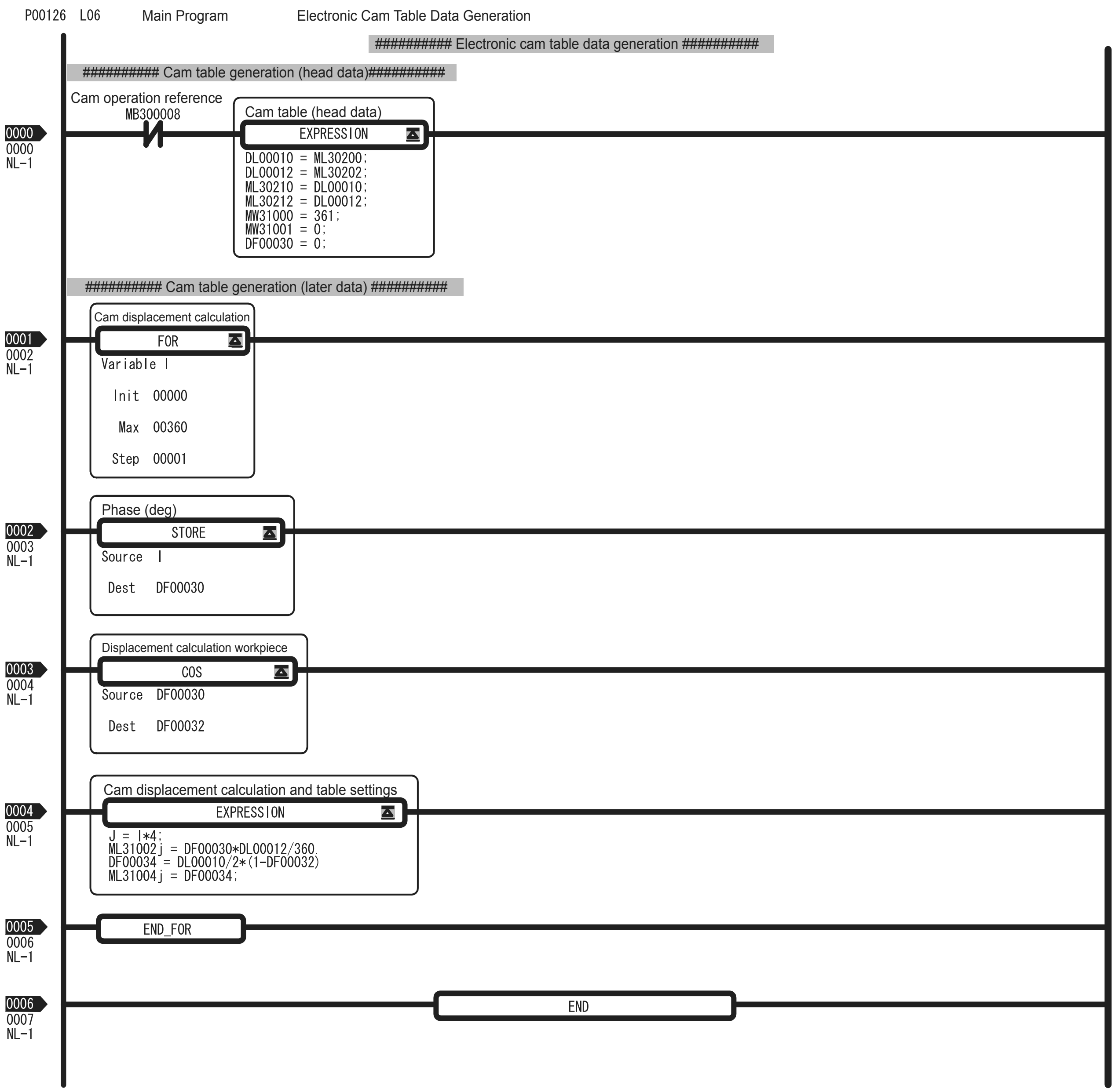
(2) L Drawing

The L parent drawing is in the low-speed scan and controls the overall sample program.



(3) L06 Drawing

The L06 child drawing generates cam pattern data for phase control (electronic cam) operation.



4

Module Specifications

This chapter explains detailed specifications for the Basic Unit and Optional Modules of the MP2200.

4.1 General Specifications

4.1.1 Hardware Specifications

The following table shows the hardware specifications of the MP2200.

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0°C to 55°C
	Ambient Storage Temperature	–25°C to 85°C
	Ambient Operating Humidity	30% to 95% (with no condensation)
	Ambient Storage Humidity	5% to 95% (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B 3501)
	Corrosive Gas	There must be no combustible or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforms to JIS B 3502. Vibration amplitude/acceleration: $10 \leq f < 57$ Hz Single amplitude: 0.075 mm $57 \leq f \leq 150$ Hz Acceleration: 9.8 m/s^2 X, Y, and Z directions 1 octave/min. sweep × 10 sweeps
	Shock Resistance	Conforms to JIS B 3502. Peak acceleration: 147 m/s^2, Usage time: 11 ms Twice each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	EN 61000-6-2 Conforms to EN 55011 (Group 1 Class A) Power supply noise (FT noise): 2 Kv min., for one minute Radiation noise (FT noise): 1 Kv min., for one minute Ground noise (impulse noise): 1 Kv min., for 10 minutes Electrostatic noise (contact discharge method): 4 Kv min., 10 times
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling

4.1.2 Function List

(1) PLC Functions and Specifications

The following table shows the PLC functions and specifications.

Item	Functions and Specifications
Control Method	Sequence: High-speed and low-speed scans
Programming Language	Ladder diagram: Relay circuits Text-type language: Numeric operations, logic operations, etc.
Scanning	Two scan levels: High-speed scan and low-speed scan High-speed scan time: 0.5 to 32 ms (Integral multiple of MECHATROLINK communication cycle) Low-speed scan time: 2 to 300 ms (Integral multiple of MECHATROLINK communication cycle)
User Drawings, Functions, and Motion Programs	Startup drawings (DWG.A): 64 drawings max. Up to three hierarchical drawing levels, Interrupt drawings (DWG.I): 64 drawings max. Up to three hierarchical drawing levels, High-speed scan process drawings (DWG.H): 200 drawings max. Up to three hierarchical drawing levels, Low-speed scan process drawings (DWG.L): 500 drawings max. Up to three hierarchical drawing levels, Number of steps: 1000 steps/drawing max., User functions: Up to 500, Motion programs: Up to 256 Revision history of drawings and motion programs Security function for drawings and motion programs
Data Memory	Common data (M) registers: 64 Kwords, System (S) registers: 8 Kwords, Drawing local (D) registers: 16 Kwords/drawing max., Drawing constant (#) registers: 16 Kwords/drawing max., Input (I) registers: 32 Kwords (including internal input registers), Output (O) registers: 32 Kwords (including internal output registers), Constant (C) registers: 16 Kwords
Trace Memory	Data trace: 128 Kwords (4 groups with 32 Kwords each). Up to 16 points can be defined.
Memory Backup	Program memory: Flash memory: 8 MBytes (User area: 5.5 MBytes), definition files, ladder programs, motion programs, etc. Data other than battery backup data Data memory: Battery backup: 256 Kbytes, M registers, S registers, alarm history, trace data
Data Type	Bit (relay): ON/OFF Integer: −32768 to +32767 Double-length integer: −2147483648 to +2147483647 Real number: ± (1.175E-38 to 3.402E+38)
Register Designation Method	Register number: Direct designation of register number Symbol designation: Up to 8 alphanumeric characters (200 symbols/drawing max.) Automatic number assignment and automatic symbols
Instructions	Program control instructions: 14 instructions, Direct I/O instructions: 2 instructions, Relay circuit instructions: 14 instructions (including set and reset coils), Logic operation instructions: 3 instructions, Numeric operation instructions: 16 instructions, Numeric conversion instructions: 9 instructions, Numeric comparison instructions: 7 instructions, Data manipulation instructions: 14 instructions, Basic function instructions: 10 instructions, Table data manipulation instructions: 11 instructions, DDC instructions: 13 instructions, System functions: 9 instructions

4.2 Base Unit

4.2.1 Outline of Functions

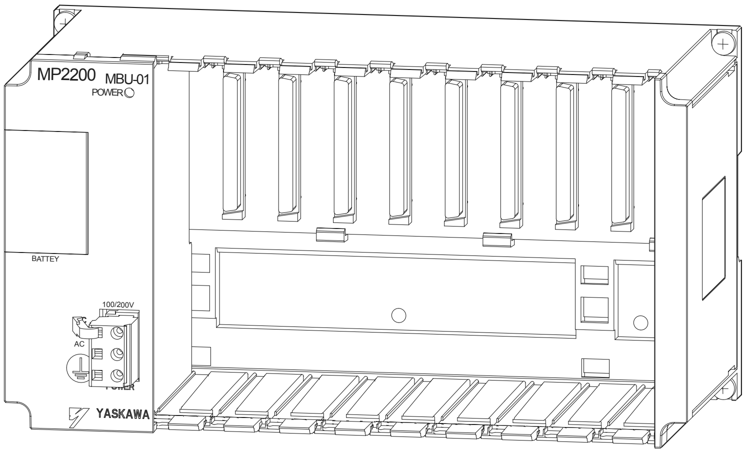
The Base Unit combines the power supply, mounting base board, and frame in one unit. Both AC-input and DC-input power supply Base Units are available. The Base Unit has a 9-slot Optional Slot configuration, which allows any Optional Modules to be used to create the perfect system for the machinery.

4.2.2 LED Indicators

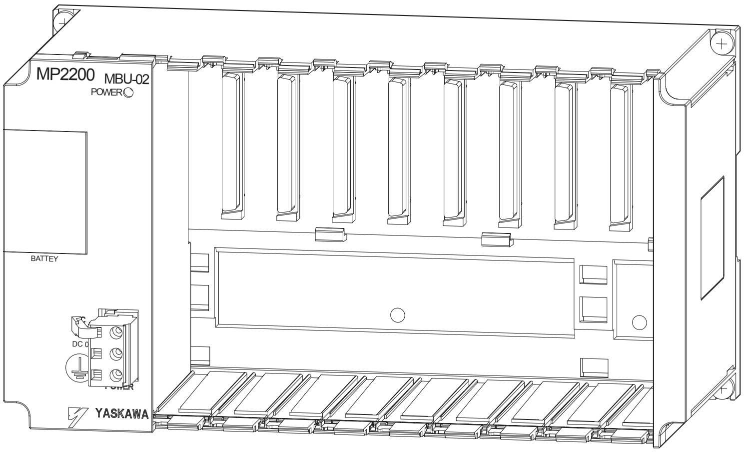
(1) External Appearance

The following figure shows the external appearance of the Base Unit.

(a) Base Unit with AC-input Power Supply



(b) Base Unit with DC-input Power Supply



(2) Indicator

The LED indicator that displays the status of the power supply is detailed in the following table.

Indicator	Indicator Name	Color	Significance when Lit
POWER ◯	POWER	Green	The power supply is operating normally.

4.2.3 Hardware Specifications

The following table shows the hardware specifications of the Base Unit.

Item		Specifications	
Name		Base Unit (AC-input power supply)	Base Unit (DC-input power supply)
Model		JEPMC-BU2200	JEPMC-BU2210
Abbreviation		MBU-01	MBU-02
Slot Configuration		One-Rack Configuration 1 slot for CPU Module 8 slots for Optional Modules (including slots for Expansion Modules) Four-Rack Configuration 9 slots for Option Modules (because a CPU Module is not mounted to Racks 2, 3, and 4)	
Power Supply	Input Voltage	85 to 276 VAC	24 VDC (±20%)
	Input Current	1.5 A max. (at rated I/O)	3.0 A max. (at rated I/O)
	Inrush Current	10 A max. (when completely discharged, 200-VAC input, rated output)	10 A max. (when completely discharged, rated output)
	Rated Voltage	5.0 V	
	Rated Current	8.0 A	
	Output Current Range	0.0 to 8.0 A	
	Coordination Error	–	±1% max.
	Constant Voltage Accuracy	±2% max. (including input voltage fluctuation and output load fluctuation)	
	Battery	Battery can be installed for memory backup.	
Indicators		POWER (green)	
Dimensions (mm)		240 × 130 × 108 (W × H × D)	
Mass		650 g	

4.3 CPU-01 Module

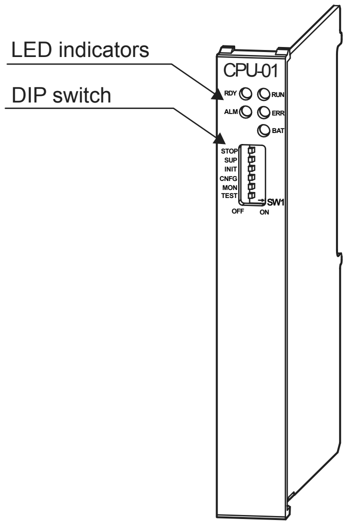
4.3.1 Outline of Functions

The CPU-01 Module is the MP2200 Control Module that controls the Motion, Communication, I/O, and other Optional Modules.

4.3.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the CPU-01 Module.



(2) Indicators

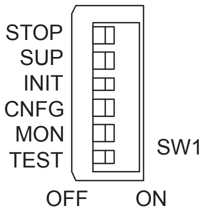
The LED indicators that display the operating status and error details for the Base Unit are detailed in the following table.

Indicators	Indicator Name	Color	Significance when Lit
RDY ◯ ◯ RUN ALM ◯ ◯ ERR ◯ BAT	RDY	Green	Unit operating normally.
	RUN	Green	User program running.
	ALM	Red	Lights/blinks for warning.
	ERR	Red	Lights/blinks for errors.
	BAT	Red	Battery alarm activated.

Note: Refer to *(2) Indicator Details* in *8.1.3 Indicator Errors* for details on the meaning of indicators.

(3) Switch Settings

The DIP switch sets the operating conditions for the CPU-01 Module when the power is turned ON.



Pin Number	Switch Name	Status	Operating Mode	Default Setting	Details
6	STOP	ON	User program stopped	OFF	Stops the user program execution. Enabled only when the power is turned ON.
		OFF	User program running		
5	SUP	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
4	INIT	ON	Memory clear	OFF	Set to ON to clear the memory. If this switch is set to OFF, the program stored in flash memory will be executed.
		OFF	Normal operation		
3	CNFG	ON	Configuration mode	OFF	Set to ON to execute self-configuration for connected devices.
		OFF	Normal operation		
2	MON	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
1	TEST	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		

4.3.3 Hardware Specifications

The following table shows the hardware specifications of the CPU-01 Module.

Item	Specifications
Name	CPU-01 Module
Model	JAPMC-CP2200
Abbreviation	CPU-01
Flash Memory	12 Mbytes
SDRAM	32 Mbytes
SRAM	512 Kbytes, M registers, S registers, trace memory, alarm history (battery backup)
Calendar	Seconds to year timer (battery backup)
Protective Functions	Self-diagnostic Mode (factory test switch) Watchdog timer Software: SH4 internal WDT Hardware: 0 to 510 ms (register setting)
Reset Circuit	Reset output for power failure detection signal (POKH) after NMI generation.
Indicators	RDY (green) RUN (green) ALM (red) ERR (red) TX (green) BAT (red)
Switches	STOP SUP INIT CNFG MON TEST
Dimensions (mm)	125 × 95 (H × D)
Mass	90 g

4.3.4 Functions and Specifications

The differences between the functions and specifications of the MP2200, MP920, and MP2300 are shown in the following table.

Item		MP2200	MP2300	MP920	Remarks
Operations Performance	CPU (CPU Performance Ratio)	SH4 (SH7750R) (240 MHz) (2.0)	SH4 (SH7750) (167 MHz) (1.3)	486DX4 (96 MHz) (1.0)	–
	Operation Performance Ratio	2.0	1.0 to 1.1	1.0	–
Control Performance	No. of Controlled Axes	Motion functions MOV function: 6 axes/ms 18 axes/2 ms	Motion functions MOV function: 4 axes/ms 12 axes/2 ms	Motion function (MOV): 12 axes/ 2 ms	Max. No. of control axes is the value for the SVB Module.
	Max. No. Control Axes	4/port (M-II: 0.5 ms) 9/port (M-II: 1 ms) 15/port (M-II: 1.5 ms) 16/port (M-II: 2 ms) 15/port (M-II: 17 bytes: 1 ms) 14/port (M-I)	9/port (M-II: 1 ms) 16/port (M-II: 2 ms) 15/port (M-II: 1.5 ms) 15/port (M-II: 17 bytes: 1 ms) 14/port (M-I)	14/port (M-I)	
Max. No. of Control Axes (Total)		256	48	244	–
Scan Time	High-speed Scan	0.5 to 32.0 ms (in 0.5 ms units)	1.0 to 32 ms (Integral multiple of MECHATROLINK communication cycle)	0.4 to 300 ms (0.1 ms units)	–
	Low-speed Scan	2.0 to 300.0 ms (in 0.5 ms units)	2.0 to 300 ms (Integral multiple of MECHATROLINK communication cycle)	1.0 to 300 ms (0.1 ms units)	–
OS		µITRON	µITRON	CPOS (stand-alone)	–
Memory Capacity	RAM Size	32 MB (SDRAM) 512 Kb (SRAM backup)	32 MB (16 MB used) SDRAM 512 Kb (SRAM backup)	2/4 MB	–
	Flash Memory Size	12 MB (4 MB firmware; 8 MB user area)	8 MB	2/4 MB	–
	Shared Memory (Computer Interface)	None	None	None	–
	User Memory	8 MB	6 MB	Same as MP2300	–
Language Memory Load Capacity	CP Language	Average: 50 bytes/step Source: 30 bytes Object: 30 bytes	Same as MP2200	Average: 50 bytes/ step Source: 30 bytes Object: bytes	Average capacity used when each language is used.
	Motion Language	Average: 240 bytes/line Source: 50 bytes Object: 285 bytes	Same as MP2200	Average: 240 bytes/ line Source: 50 bytes Object: 190 bytes	–
	C Language	Being considered for development.	Same as MP2200	–	–

(cont'd)

Item		MP2200	MP2300	MP920	Remarks
Trace	Data Trace	128 kW (32 kW × 4 Gr)	Same as MP2200	Same as MP2200	MP2200 does not have battery backup.
	Failure Trace	None	Same as MP2200	Same as MP2200	–
No. of Program Language Instructions	CP Ladder	Approx. 120	Same as MP2200	Same as MP2200	–
	Motion Language	Approx. 70	Same as MP2200	Same as MP2200	–
	C language	Being considered for development.	Same as MP2200	Not supported	–
	Motion API (Provided by System)	Approx. 150	Same as MP2200	Not supported	–
	User Functions (Created by User)	500	Same as MP2200	Same as MP2200	–
Data Type	Bit	Supported	Same as MP2200	Same as MP2200	–
	Word (Integer)	Supported	Same as MP2200	Same as MP2200	–
	Long (Double-length Integer)	Supported	Same as MP2200	Same as MP2200	–
	Real Number	Supported	Same as MP2200	Same as MP2200	–
	Text	Supported	Same as MP2200	Same as MP2200	–
Variable Designation Method	Register No. Designation	Supported	Same as MP2200	Same as MP2200	–
	Symbol Designation	Supported	Same as MP2200	Same as MP2200	–
	Subscript (CP Ladders)	Supported	Same as MP2200	Same as MP2200	–
Register Size	M Registers	64 kW	Same as MP2200	32 kW	–
	S Registers	4096 W	Same as MP2200	1024 W	–
Memory Backup (Program, Data)		Flash memory (M registers backed up by battery)	Same as MP2200	SRAM (entire SRAM backed up by battery)	–
On-board I/O (CPU Module)		Not supported	8 DI (1 also used for interrupts) 4 DO	Not supported	–
Optional Module		35 Optional Module slots LIO, SVA, SVB, 218, 217, PROFI, DeviceNet, EXIF, AFMP, CSIF	3 Optional Module slots LIO, SVA, SVB, 218, 217, PROFI, DeviceNet, AFMP, CSIF	36 Optional Module slots max. M-I, Ethernet, serial, LIO, SVA, etc., supported	AFMP and CSIF being developed.
Engineering Port (RS-232C)		Optional Module	Same as MP2200	1 port on CPU (ports can be added with Optional Module)	–

(cont'd)

Item		MP2200	MP2300	MP920	Remarks
Engineering Functions	Program Loader	Supported	Same as MP2200	Same as MP2200	Servo tuning must be considered together with M-II message transmissions.
Engineering Functions	Variable Settings/Monitoring	Supported	Same as MP2200	Same as MP2200	–
Engineering Functions	Traces	Supported	Same as MP2200	Same as MP2200	–
Engineering Functions	Servo Tuning	Not supported	Not supported	Not supported	–
Other Functions	Self-configuration	Supported	Same as MP2200	Not supported	–
Other Functions	Remote API	Supported	Same as MP2200	Not supported	–
Other Functions	Calendar	Supported	Same as MP2200	Same as MP2200	–
Other Functions	OS Load	Supported (Special tool or communication)	Same as MP2200	Same as MP2200	Optional Modules must be able to load the OS, but this must be considered together with M-II message transmissions.

Note: M-I: MECHATROLINK-I, M-II: MECHATROLINK-II

4.4 CPU-02 Module

4.4.1 Outline of Functions

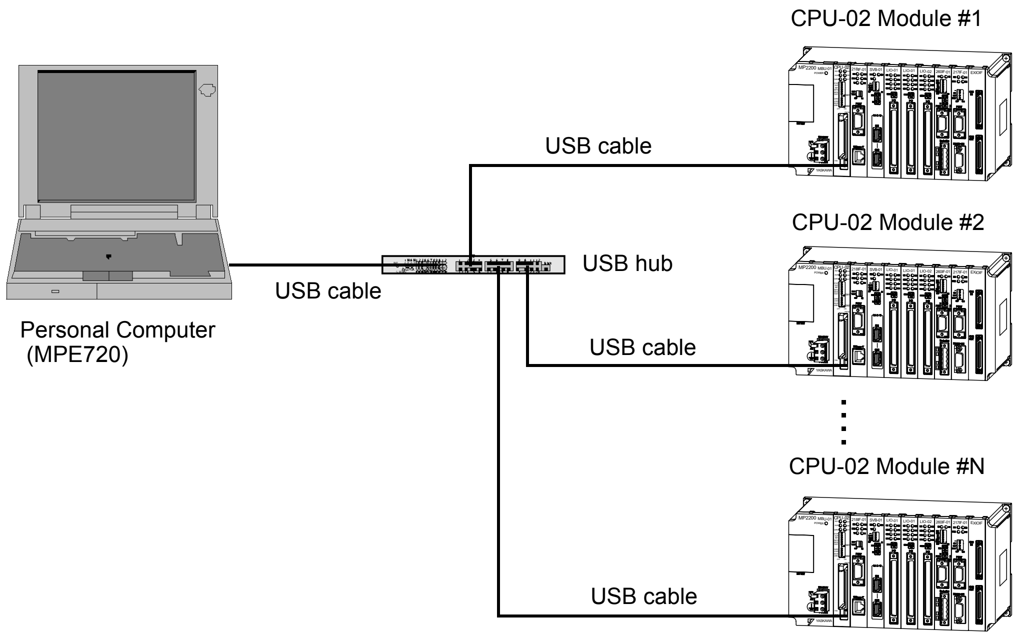
The CPU-02 Module is used exclusively for the MP2200, and has been developed as a higher level of CPU-01 Module. In addition to the expansion of the user memory, the CPU-02 Module is highly generalized, and has one Compact Flash port and one USB port.

The Compact Flash already in the Compact Flash slot can be used to back up applications directly without going through the MPE720 to save them as a batch. Also, applications can be loaded from the Compact Flash directly to the CPU in batch loads.

The USB connector has only one channel, which works as a port only for the MPE720. With a USB hub, several CPU-02 Modules can be controlled with one personal computer (MPE720).

Note: MPE720 version 5.31B or later.

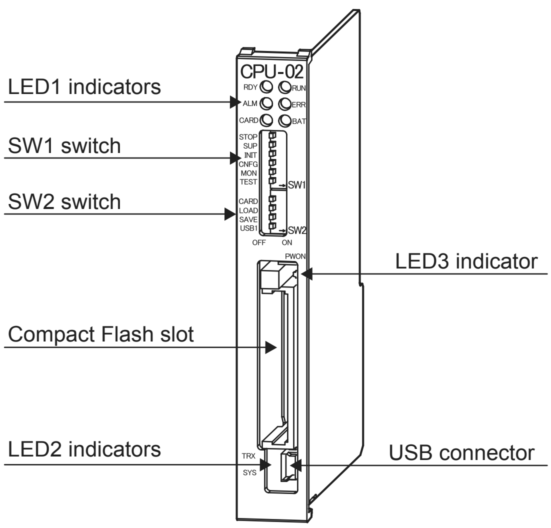
- Example Using Several CPU-02 Modules



4.4.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the CPU-02 Module.



Note: A dummy card is inserted in the Compact Flash slot to prevent dust from entering before shipment.

(2) Indicators

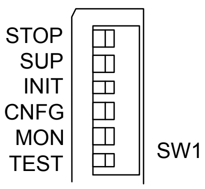
The following table shows the indicators that show the operating status of the CPU-02 Module and error information.

Indicators	Indicator Name	Color	Significance when Lit
LED1 RDY RUN ALM ERR CARD BAT	RDY	Green	Unit operating normally. *1
	RUN	Green	User program running. *1
	ALM	Red	Lights/blinks for warning. *1
	ERR	Red	Lights/blinks for errors.*1
	CARD	Green	Accessing of the Compact Flash.
	BAT	Red	Battery alarm activated.*1
LED2 TRX SYS	TRX	Green	Communicating with USB.
	STS	Red	Status of the CPU side displayed. *2
LED3 PWON (On the side of the Compact Flash connector lever)	PWON	Green	Supplying power to the Compact Flash.

* 1. Refer to *(2) Indicator Details* in *8.1.3 Indicator Errors* on the meaning of indicators.
* 2. Refer to *(3) Details of LED Display (LED2) for USBs* in *4.4.5 USB Interface* for details of the LED displays.

(3) Switch Settings

(a) SW1



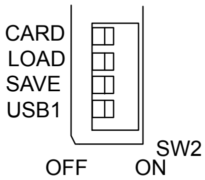
The SW1 is used to set the operating conditions for the CPU-02 Module when the power supply is turned ON.

Before turning ON the power supply, set this switch. Any settings made after the power supply is turned ON are invalid.

Pin Number	Switch Name	Status	Operating Mode	Default Setting	Details
6	STOP	ON	User program stopped	OFF	Stops the user program execution. Enabled only when the power is turned ON.
		OFF	User program running		
5	SUP	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
4	INIT	ON	Memory clear	OFF	Set to ON to clear the memory. Also set to ON not to save the data in the compact flash. If this switch is set to OFF, the program stored in flash memory will be executed.
		OFF	Normal operation		
3	CNFG	ON	Configuration mode	OFF	Set to ON to execute self-configuration for connected devices.
		OFF	Normal operation		
2	MON	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
1	TEST	ON	System use (adjusted before shipment)	OFF	Always leave set to OFF.
		OFF	Normal operation		

(b) SW2

The SW2 is used to set the operating conditions for the Compact Flash slot and the USB connector.



Pin Number	Switch Name	Status	Operating Mode	Default Setting	Details
4	CARD	ON	Compact Flash enabled.	OFF	Turns the power supply to the Compact Flash ON or OFF.
		OFF	Compact Flash disabled.		
3	LOAD	ON	Executes batch load from the Compact Flash (Compact Flash → CPU).	OFF	Enabled when switches SW2 to SW4 are ON and Compact Flash is enabled. With the LOAD switch set to ON, a batch load from the Compact Flash is executed when the power supply is turned ON.
		OFF	Batch load is not executed.		
2	SAVE	OFF ↓ ON	Save (CPU → Compact Flash).	OFF	Enabled when switches SW2 to SW4 are ON and Compact Flash enabled. By turning it from OFF to ON, a batch save to the Compact Flash is executed.
1	USB1	ON	USB local address1.	OFF	Turning this switch to ON initializes the USB local address and sets it to 1 by force.
		OFF	In accordance with the definition of the host.		

4

4.4.3 Hardware Specifications

The following table shows the hardware specification of the CPU-02 Module.

<table>
<tr><th>Item</th><th colspan="2">Specifications</th></tr>
<tr><td>Name</td><td colspan="2">CPU-02 Module</td></tr>
<tr><td>Model</td><td colspan="2">JAPMC-CP2210</td></tr>
<tr><td>Abbreviation</td><td colspan="2">CPU-02</td></tr>
<tr><td>Flash Memory</td><td colspan="2">16 MBytes (User's area: 11.5 MBytes)</td></tr>
<tr><td>SDRAM</td><td colspan="2">32 MBytes</td></tr>
<tr><td>SRAM</td><td colspan="2">2 MBytes, M registers, S registers, trace memory, alarm history (battery backup)</td></tr>
<tr><td>Memory Backup (Programs, Data)</td><td colspan="2">Compact Flash interface × 1 slot</td></tr>
<tr><td>Engineering Port</td><td colspan="2">USB interface × 1CH</td></tr>
<tr><td>Calendar</td><td colspan="2">Seconds to year timer (battery backup)</td></tr>
<tr><td rowspan="2">Indicators</td><td rowspan="2">LED1
RDY (green)
RUN (green)
ALM (red)
ERR (red)
TX (green)
BAT (red)</td><td>LED2
TRX (green)
SYS (red)</td></tr>
<tr><td>LED3
PWON (green)</td></tr>
<tr><td>Switches</td><td>SW1
STOP
SUP
INIT
CNFG
MON
TEST</td><td>SW2
CARD
LOAD
SAVE
USB1</td></tr>
<tr><td>Dimensions (mm)</td><td colspan="2">125 × 95 (H × D)</td></tr>
<tr><td>Mass</td><td colspan="2">Approx. 75 g</td></tr>
</table>

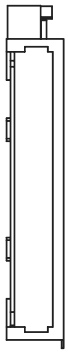
Note: For general specifications such as hardware specifications and PLC function specifications, refer to *4.1 General Specifications*.

4.4.4 Compact Flash Interface

The specifications of the Compact Flash are described here.

(1) Specifications

(a) The Compact Flash Slot



- Connector

Name	No. of Pins	Connector Model		
		Module Side	Cable Side	Manufacturer
Compact Flash Slot	50	MI21A-50PD-SF-EJR(31)	–	Hirose Electric Co., Ltd.

Compact Flash Slot (Without Compact Flash)

(b) General Specifications

The following table shows the general specifications of the Compact Flash interface.

Item	Specifications	Remarks
Slot Standard	For Compact Flash (TYPE-I)	50 pins
Number of Slots	1	–
Interface	PC card ATA	True IDE is not supported.
Corresponding Media	Compact Flash (TYPE-1)	The Compact Flash described in the following table is recommended.*
Media Memory Capacity	32 MB, 64 MB, 128 MB, 256MB, 512MB	–
For Partition	Not available	–
Corresponding FAT	FAT12/16/32, VFAT (long name)	Up to 256 characters of a file name are available when VFAT is used, but only 246 characters are actually allowed because of full path designation.
Max. No. of Directory Nets	10	–
File Information	Report of updating date available	Calendar function of the controller is used.
Max. Length of File Name and Directory Name	256 characters	Total number of characters in file names and directory names.
Current Directory Function	Not available	–
Max. No. of Simultaneous Open Files	16	–

* Micro drive, I/O device, or HDD is not supported.

- Recommended Compact Flash / Adapter (Available from YASKAWA)

Model	Specifications	Manufacturer
CFI-128MDG	128 MB	Hagiwara Sys-Com Co., Ltd.
CFI-256MDG	256 MB	
CFI-512MDG	512 MB	
CFC-ADP03	PC-card adapter* (for the PCMCIA connector)	

* Use a PC-card type adapter when the Compact Flash is used with a personal computer.
By mounting the Compact Flash on a PC-card adapter, it can be used as a PC-Card Type-II Flash Card.

• Operation Confirmed Compact Flash (Available from an electronics shop)

Model	Specifications	Manufacturer
SDCFB-64-J60	64 MB	SanDisk Corporation
SDCFB-128-J60	128 MB	
HPC-CF64V	64 MB	Hagiwara Sys-Com Co., Ltd. (V Series)
HPC-CF128V	128 MB	
HPC-SD128T	128-MB SD memory card	Hagiwara Sys-Com Co., Ltd.
HPC-CDA01	Compact Flash-type SD memory card adapter	

(c) Functions

The following table shows the specifications of the functions for the Compact Flash interface.

Item	Specifications	Descriptions
Operation Switch	3 pins for SW2	CARD: Enables or disables use of media. LOAD: Executes batch load if set to ON when power supply is turned ON. SAVE: Executes a batch save when turned from OFF to ON.
Batch Load	Compact Flash → CPU (Flash memory)	• Executes and controls operation in accordance with settings of SW2. • The data to be transferred is: User application + register.
Batch Save	CPU (SDRAM) → Compact Flash	

(d) Compact Flash-Related System Registers

The following table shows the specifications of the system register related to the Compact Flash interface.

Specifications	Register Number		Description	
Whole capacity of Compact Flash Card	SL00652		Unit: Byte	
Card Status	SW00654	SB006540	0: Compact Flash card not mounted	1: Compact Flash card mounted
		SB006541	0: Power not supplied	1: Power being supplied
		SB006542	0: Compact Flash card not identified	1: Compact Flash card being identified
		SB006543	0: No Compact Flash card access	1: Compact Flash card being accessed
		SB006544	0: –	1: FAT file system being checked
		SB006545 to SB00654F	Reserved for system	
FAT Type	SW00655	0001H	FAT12	
		0002H	FAT16	
		0003H	FAT32	
Reserved for system	SW00656		–	
Reserved for system	SW00657		–	
Batch Load/Save	SW00658	SB006580	During batch load	
		SB006581	Compact Flash card read-out error	
		SB006582	Load file model mismatched	
		SB006583	Load file write-in error	
		SB006584	Flash-storage error	
		SB006585	No batch load folder exists.	
		SB006586	Load error due to prohibition of load (program write protection)	
		SB006587	Reserved for system	
		SB006588	During a batch save	
		SB006589	Compact Flash card write-in error	
		SB00658A	Save file read-out error	
		SB00658B	Security error	
		SB00658C to SB00658F	Reserved for system	
Reserved for system	SW00659		–	

4

(2) Precautions when Using Compact Flash

Pay attention to the following points when using the Compact Flash.

• Removing and Reattaching the Compact Flash

Before removing or inserting the Compact Flash, turn the switches SW2 to SW4 (CARD) to OFF, and confirm that the CARD and PWON LED indicator lamps are unlit.

If the Compact Flash is removed or inserted while these LED indicator lamps are lit, the data stored in the Compact Flash may be damaged.

• Formatting the Compact Flash

Format the Compact Flash in Windows 2000 or Windows XP. The CPU-02 Module cannot be used to format the Compact Flash.

Note: The Compact Flash purchased from YASKAWA has already been formatted.

• FAT Check and Restoration of Compact Flash

If the Compact Flash is removed or if the power supply is turned OFF while accessing with the CARD LED indicator lamp lit, the FAT in the Compact Flash may be damaged.

The CPU-02 Module checks the FAT when SW2-4 (CARD) is turned ON and attempts to restore the data if the FAT is damaged. During data restoration, the CARD LED indicator lamp will flicker ON and OFF, because the Compact Flash is accessed automatically. This is not a failure.

It may take 10 minutes or more to restore the FAT. If in a hurry, forcibly remove the Compact Flash and run an error check on the personal computer to restore the data.

• INIT Switch Setting and Transfer of Registers M, S, I, and O

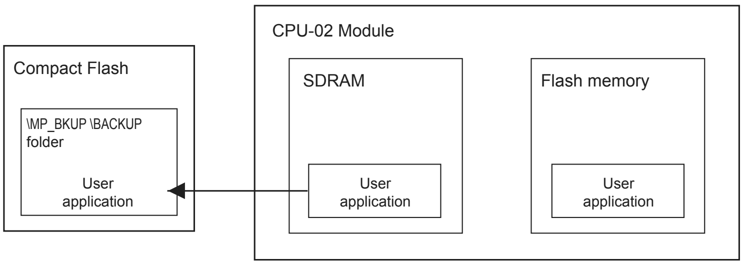
The following table shows registers M, S, I, and O to be transferred between the Compact Flash and the controller according to the status of the INIT switch for the SW1 switch.

Setting of INIT (SW1) Switch	OFF	ON
At batch save	M, S, I and O Registers	–
At batch load	M Register	–

Note: 1. S, I, and O registers are not transferred in a batch load, so the INIT setting is ignored.
2. Registers other than M, S, I, and O registers are transferred either in a batch save or a batch load ignoring the INIT setting.

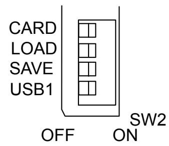
(3) Batch Save to Compact Flash

By using the DIP switches, the batch save function of the CPU-02 Module can save all the user application data from the RAM to the specified folder and file, \MP_BKUP\BACKUP, of the Compact Flash without going through the MPE720.



Note: 1. If data in the Compact Flash has already been saved in a batch or another form written in from the MPE720, it will be cleared when a new batch is saved.
2. A batch load is not possible if a motion register is used for trace definition, or if the relevant motion module is not defined or not mounted.
3. The security function is not provided for program transfers with the Compact Flash in the CPU software (version 2.41). The security function will be made available in April, 2005.

The procedure for batch saving to the Compact Flash is as follows:

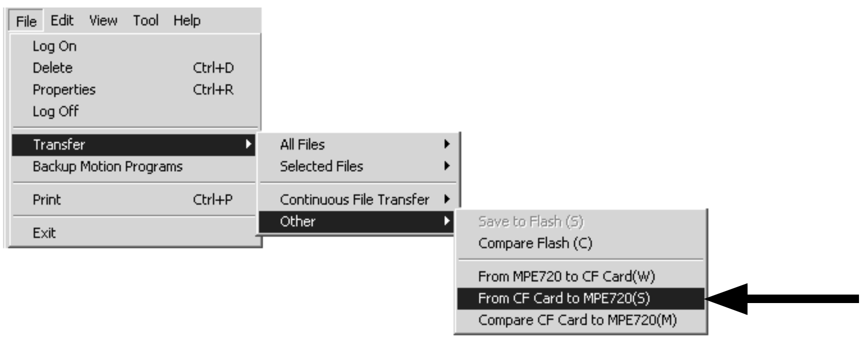


1. Confirm that the CARD, LOAD and SAVE of the CPU-02 Module's SW2 are set to OFF.
2. Insert the formatted Compact Flash into the Compact Flash slot on the CPU-02 Module with the power supply ON.
3. Turn the CARD switch to ON.
   The PWON LED indicator lamp will light up.
4. Turn the SAVE switch to ON.
   The batch save will start, and the CARD LED indicator lamp will light up. When a batch save is completed, the CARD LED indicator lamp will go out.
   Note: If the operation fails, the ALM LED indicator lamp will light up, and the error will be reported to the system register SW00658. Refer to *(d) Compact Flash-Related System Registers* in *4.4.4 Compact Flash Interface (1) Specifications*.
   Executing batch save again or restarting the MP2200 will extinguish the ALM LED indicator lamp.

• How to Input Data from the Compact Flash to the MPE720

How to store the applications that are saved as a batch in the Compact Flash, into the MPE720 (Ver. 5.3B or later), is as follows:

1. Log on from off-line and open the PLC folder where the data is saved as a batch.
2. Select ***File - Transfer - Other - From CF Card to MPE720(S)***.



3. Click the **Change** button of the source. Enter *the drive name of the Compact Flash, \MP_BKUP\BACKUP*, for the source, and click the **OK** button.
   The data will be transferred to the MPE720.

   Note: If \MP_BKUP\BACKUP is copied to another folder in another drive after a batch save to the Compact Flash, the source folder can be specified.

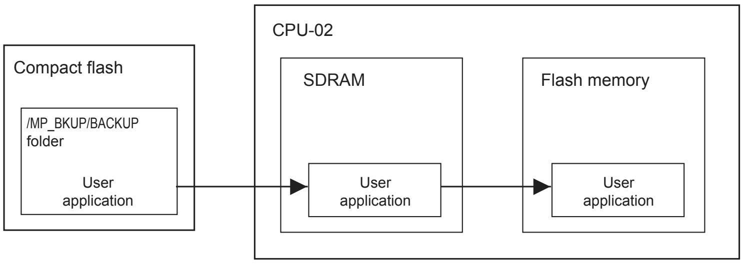
- Writing in from the MPE720 to the Compact Flash

Although data can be written into the Compact Flash *, only data that is dumped simultaneously from the controller can be written. If data that is created or edited off-line is written in to the Compact Flash, an error may occur in a batch load.

* To write data into the Compact Flash, select ***File - Transfer - Other - From CF Card to MPE720(S), or Compare CF Card to MPE720(M)***.

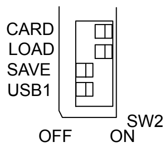
(4) Batch Load from Compact Flash

By using only the DIP switches, you can use the batch load function of the CPU-02 Module to read in user application data in the Compact-Flash-specified folder and file, /MP_BKUP/BACKUP, and also flash-store the data without going through the MPE720.



To load data in a batch from the Compact Flash, use the following procedure:

1. Insert the Compact Flash with the backup application data into the CF slot of the CPU-02 Module with the power supply OFF.
2. Turn the CARD and LOAD switches in SW2 of the CPU-02 Module to ON.



3. Turn ON the MP2200 power supply.
   The PWON LED indicator lamp will light up, and the batch load will start. The CARD LED indicator lamp will light up, and the RUN LED indicator lamp will blink. When all of the data has been successfully read out from the Compact Flash, the CARD LED indicator lamp will turn OFF.
   After the data has been successfully saved, the RUN and PWON LED indicator lamps will turn OFF.

   Note: If the batch load fails, the ALM LED indicator lamp will light up and the error will be reported to system register SW00658. Refer to *(d) Compact Flash-Related System Registers* in *4.4.4 Compact Flash Interface (1) Specifications*. If you restart the MP2200, the ALM LED indicator lamp will turn OFF.

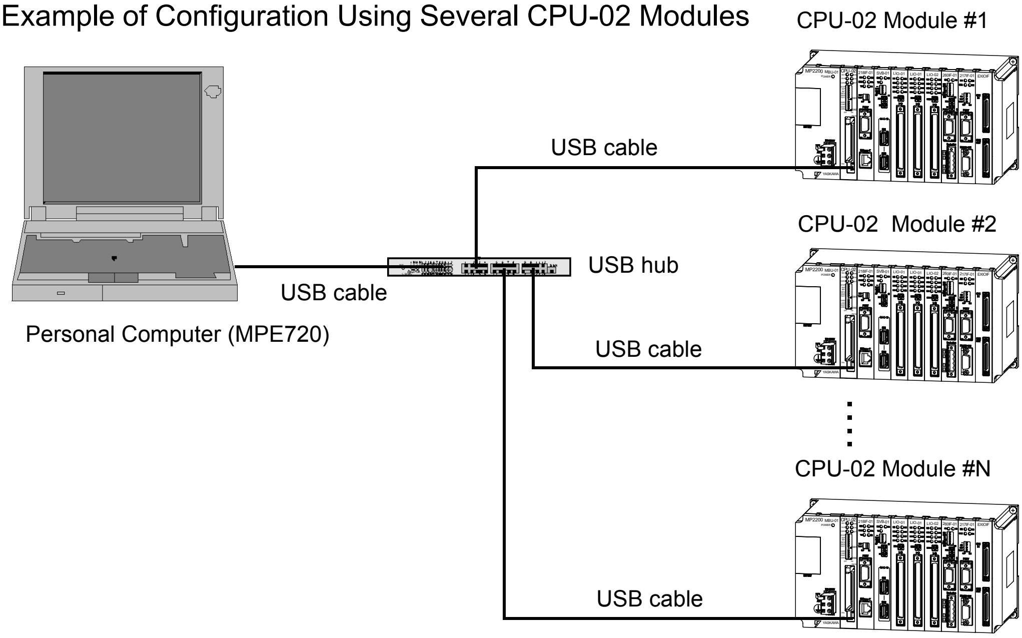
4. Turn OFF the MP2200 power supply.
5. Turn OFF the CARD, LOAD, and INIT switches. Then, turn ON the MP2200 power supply to start from the flash memory.

4.4.5 USB Interface

(1) Outline

By connecting a personal computer incorporating the MPE720 directly, or via USB hub with the CPU-02 Module, MP2200 controller engineering is possible from the personal computer (MPE720).

• Example of Configuration Using Several CPU-02 Modules



Note: 1. USB corresponding communications process and exclusive-use device driver must be installed for this function. For an installation guide, refer to *(4) Compact Flash-Related System Registers* in *4.4.4 Compact Flash Interface*.
2. Up to 5 USB hubs can be connected.

(2) General Specifications

The following table describes the general specifications of the USB interface.

Item	Specifications	Remarks
Standard	In accordance with USB2.0 Full-speed function	–
Bus speed	Full speed (12 Mbps)	–
Format	Asynchronous serial	–
Communication Method	Half duplex	–
Connected Devices	One USB host, 127 slaves	Including hub
Cable	USB cable available at most electronics stores	Connector: PC side: Series A plug Module side: Series mini-B plug
Cable Length	Full-speed: 5 m (30 m at full speed with Hub 5-layer connection)	–
Connector Type	Series mini-B plug	–
Power Supply	Self-powered type	Shares power supply with the MP2200.

(3) Details of LED Display (LED2) for USBs

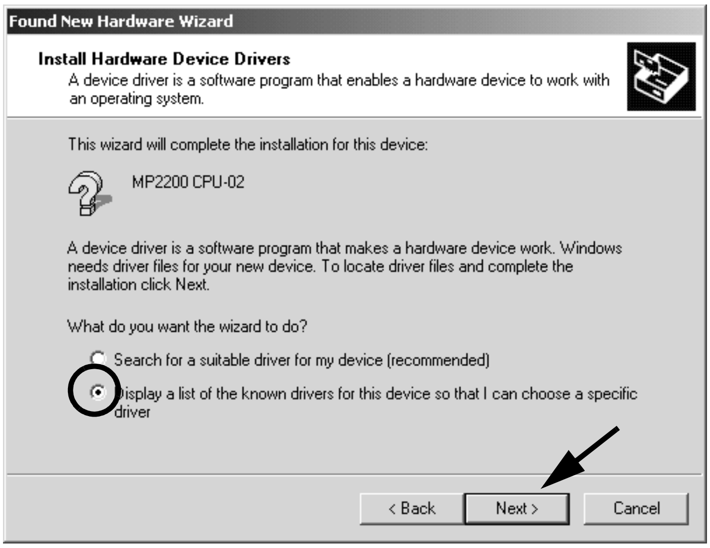
Classification	Indicator Name		Indicator Details	Description
	TRX	STS		
Normal Operation	Not lit	Not lit	During normal operation	LED is OFF when USB transmission is not carried out even after the power supply is turned ON.
Transmission	Blinking	Not lit	During USB transmission	TRX flashes during USB transmission.
Error	Undefined	Blinking	Hardware error (Meaning differs depending on the number of blinks.) Number of blinks and error 1: ROM diagnostic error 2: RAM diagnostic error 3: Shared-memory diagnostic error 15: Watch-dog time over	Hardware error in the USB-control section. The module must be replaced.
Boot	Not lit	Not lit	During flash deletion. During flash write-in. Flash write-in completed successfully. Flash write-in completed with error.	TRX and SYS do not light up during flash write-in of the USB firmware. To confirm the flash write-in status, check the display of the operation for the flash write-in software in the host computer.

(4) Installing the Hardware Driver

Before connecting the MP2200 (CPU-02 Module) to the personal computer via a USB for the first time, the USB communications driver for the MP series must be installed. Prepare the setup disc (Ver 5.31B or later) of the MPE720, and install the USB driver as described in this section.

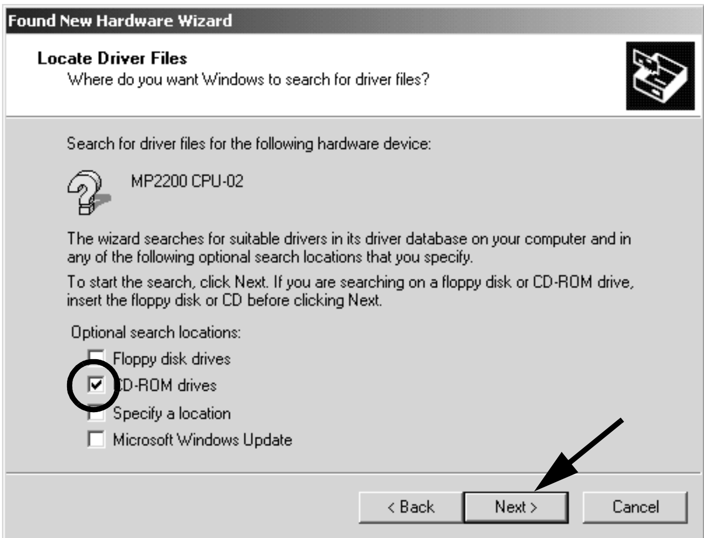
1. Connect the USB port on the CPU-02 Module to the USB port on the personal computer with a USB cable (series mini-B), and turn ON the MP2200 power supply.
2. A message **Find New Hardware** will be displayed. Then, **Found New Hardware** Wizard will be displayed. Click the **Next** button.

3. Select **Display a list of the known drivers for this device so that I can choose a specific driver** and click the **Next** button.



A message will appear, asking where to find the driver.

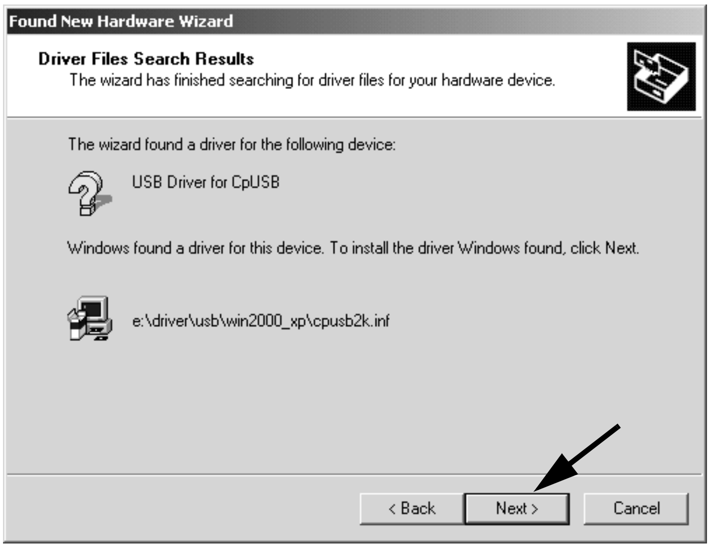
4. Insert the MPE720 setup disc into the CD-ROM drive.
5. Select **CD-ROM drives** and click the **Next** button.



If the driver is found, the search results will appear.

4

6. Click the **Next** button.



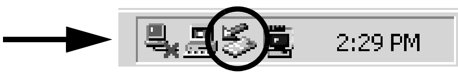
The installation will start.

7. After the driver has been successfully installed, click the **Finish** button.

(5) Removing the Cable from the USB Connector

When removing the cable from the USB connector on the personal computer, the USB hub, or the CPU-02 Module, or when turning OFF the MP2200 power supply connected to a USB, perform the following operations to safely undo the connections.

1. In the task tray at the lower right of the window, click the icon to remove the device.



A message **Stop USB Mass Storage Device-Drive (F:)** will appear.

2. Click inside the window.

The connection will be cut and a window, **The 'USB Mass Storage Device' device can now be safety removed from the system**, will appear. After this message appears, the cable can be safely removed and the MP2200 power supply can be turned OFF.

Click the inside the window or click the **OK** button in the dialog box to close the window.

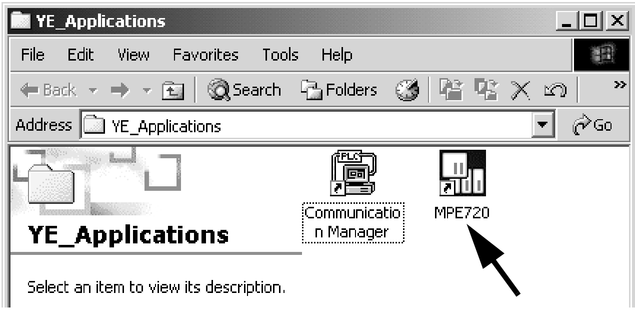
(6) Setting the Communication Process for the USB Connection

Set the USB connection as described in this section.

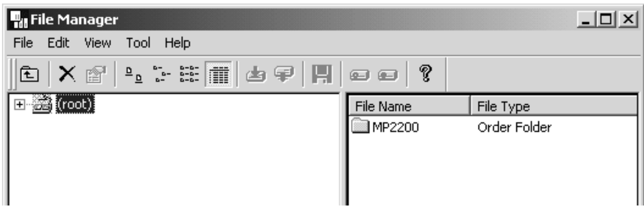
Note: For any connection-setting methods other than USB, refer to *(3) MPE720 Startup Procedure* in *3.1.6 Starting the MPE720*.

1. Open the **YE_Applications** Folder and double-click the **MPE720** Icon, or select MPE720 from the start menu.

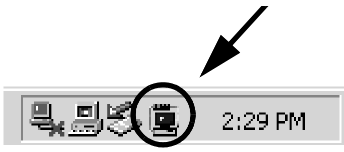
   Note: This procedure varies depending on the OS.



   MPE720 will start up and the **File Manager** Window will appear. The **Communication Process** Icon will be displayed at the bottom of the pane.

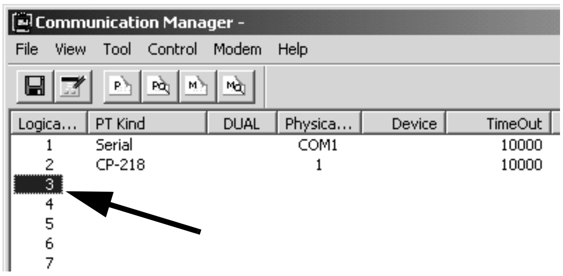


2. Double-click the **Communication Process** Icon in the task tray to view the **Communication Manager** Window.



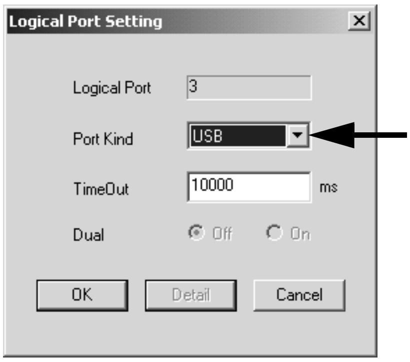
   In this example, the USB connection setting is allocated to number 3 of Logical PT in the **Communication Manager** window.

3. Double-click **3** in the **Logical PT** Column in the **Communication Manager** Window.

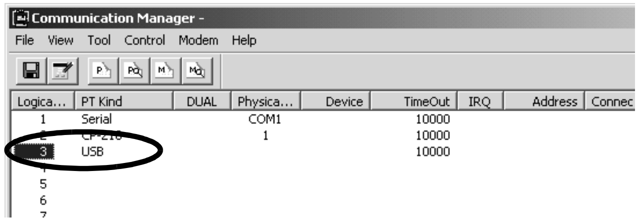


   The **Logical Port Setting** Dialog Box will appear.

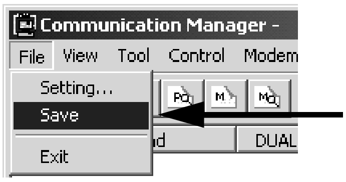
4. Set **Port Kind** to **USB** and do not change the **TimeOut** setting from the default value of 10,000 ms. Then click the **OK** button.

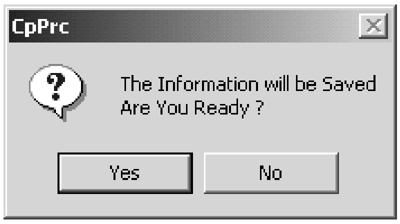


5. The **Communication Manager** Window will appear again. Confirm that the **USB** has been allocated to number **3** of **Logical PT**.

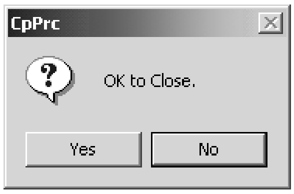


6. On the ***File*** menu, select ***Save***. A Dialog Box will appear asking if you want to save the communication port settings. Click the **Yes** button.

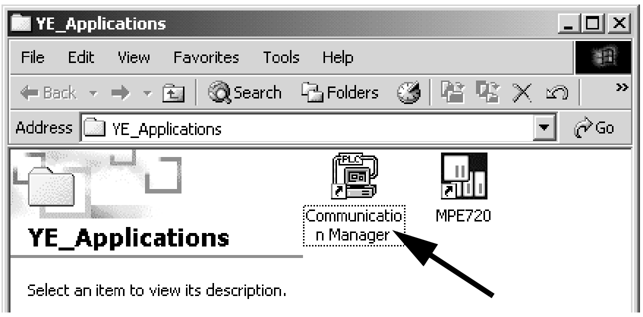




7. On the ***File*** menu, select ***Exit*** to close the **Communication Manager** Window. A Dialog Box will appear asking if you want to quit the Communication Manager. Click the **Yes** button.



8. To restart the Communication Manager, double-click the **Communication Manager** Icon in the **YE_Applications** Folder.



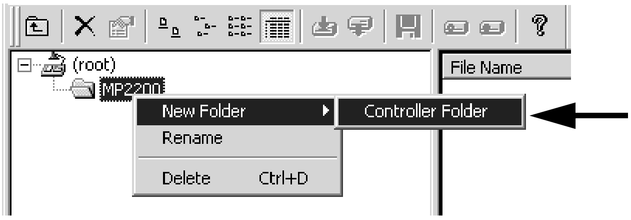
Restarting the **Communication Manager** Window validates the setting of the communications process.

(7) Creating a PLC Folder for USB Connection

How to create a PLC folder for whose model name the CPU-02 Module and the local address are specified is as follows. Before creating a PLC folder, create an order file.

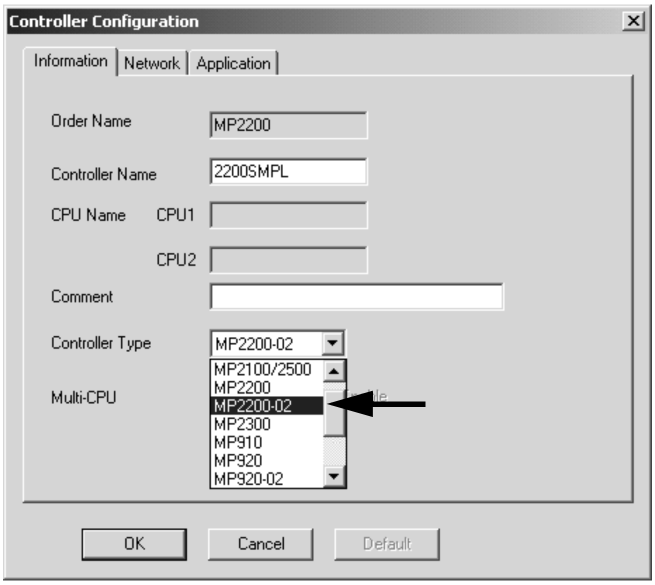
Note: For details on how to make order file folders, refer to *(4) Creating Group Folders* and *(5) Creating an Order Folder* in *3.1.6 Starting the MPE720.*

1. Select the order folder where a PLC folder is to be created, and right-click it. Point to New Folder and then select Controller Folder.



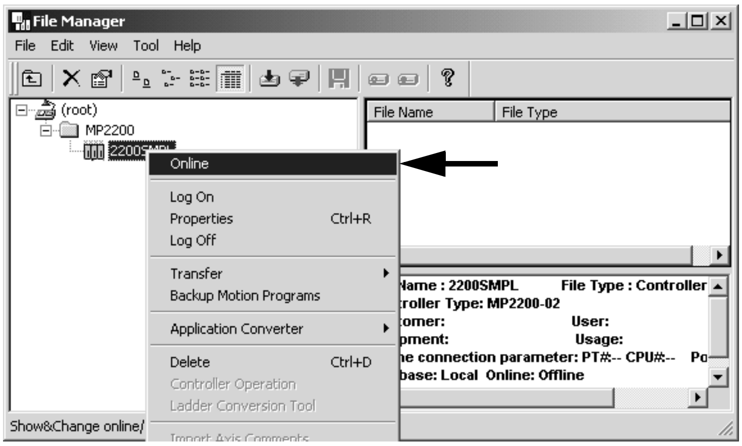
The Controller Configuration box will appear.

2. In the **Controller Name** Field, enter the name of the order folder to be created. The name must be eight alphanumeric characters. Select **MP2200-02** as the **Controller Type**, and then click the **OK** button.



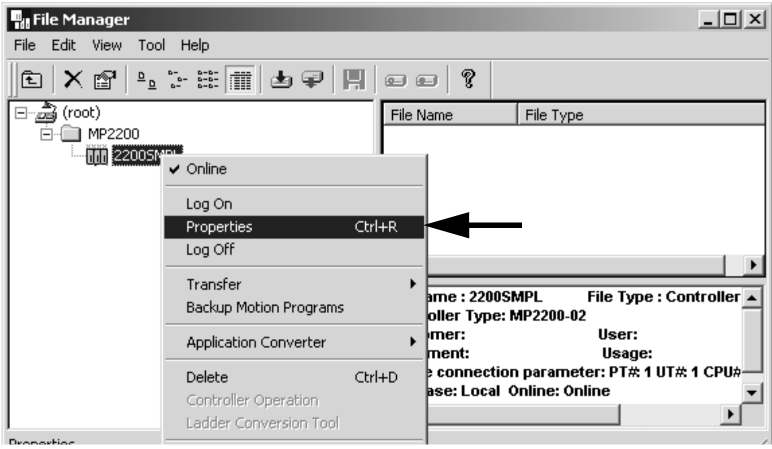
A new PLC folder will be created. Click the order folder or the plus sign, ⊞, to view the name of the new PLC folder.

3. Right-click the new PLC folder and select ***Online*** on the short-cut menu.



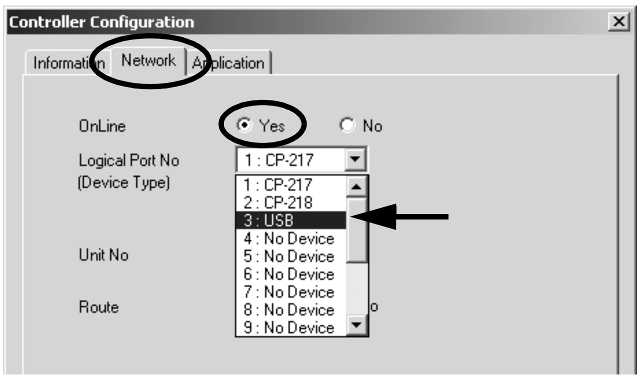
A confirmation dialog box will appear. Click the **Yes** button to switch to the online mode.

4. Right-click the PLC folder that was selected in step 3, and select ***Properties*** on the short-cut menu.

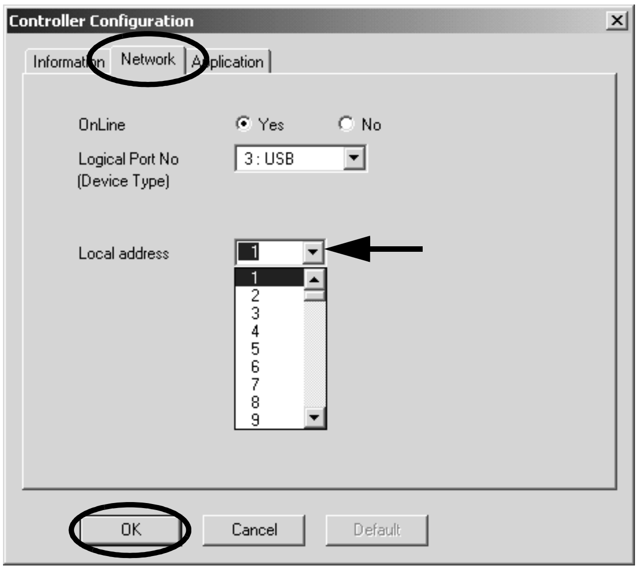


The Controller Configuration Dialog Box will appear.

5. Select the **Network** Tab and click the **Yes** button to start OnLine mode. Then select the logical port number to which the USB connection will be allocated in the Logical Port No (Device Type) list.



6. Set the Local Address, and click the **OK** button.



Note: The local address to be set in this paragraph is used to specify the corresponding CPU-02 Modules from the MPE720 (personal computer) side. If one CPU-02 Module is connected to the personal computer, set it to 1. If more than one CPU-02 Module is connected to the personal computer, use the appropriate setting. For details, refer to *(8) Setting the Local Station when Connecting Several CPU-02 Modules via USB* in *4.4.5 USB Interface*.

4

(8) Setting the Local Station when Connecting Several CPU-02 Modules via USB

To connect several CPU-02 Modules to the personal computer via the USB hub, perform the following connections and settings. Incorrect settings may overlap local addresses, resulting in an error.

1. Execute self-configuration in advance before the USB connection of a CPU-02 Module that is being used for the first time.

   Note: For the self-configuration execution procedure, refer to *(4) Executing MP2200 Self-configuration* in *3.1.5 Initializing the System*.

2. If some CPU-02 Modules are already connected, remove all the CPU-02 cables from the USB hub.

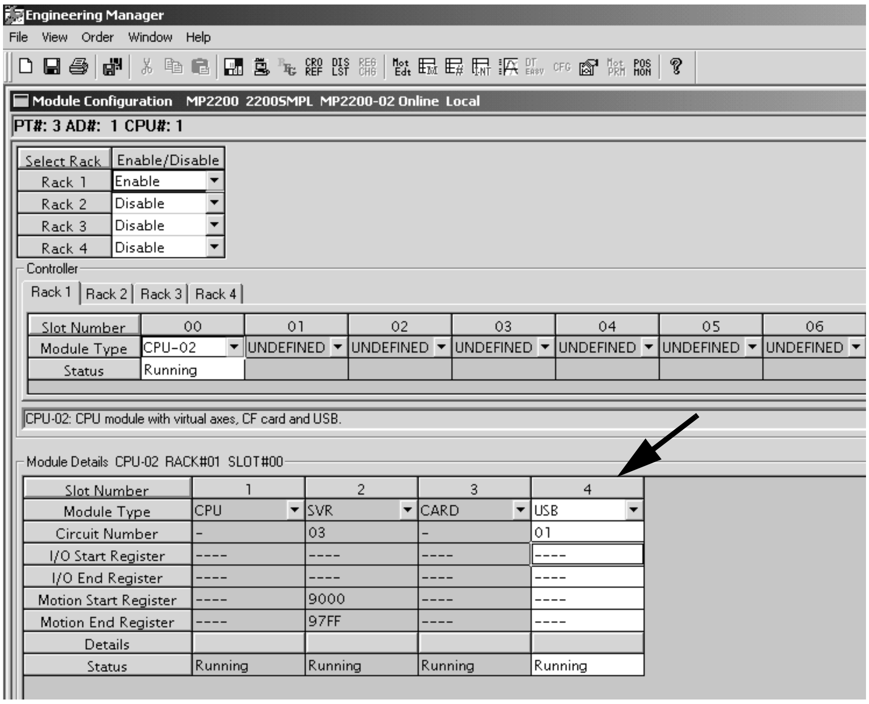
   Note: Refer to *(5) Removing the Cable from the USB Connector* o remove the cable safely in *4.4.5 USB Interface*.

3. After turning ON the USB1 switch (SW2) of the CPU-02 Modules where the local station is to be set, use the USB cable to connect the CPU-02 Modules to the USB hub.

4. Refer to *(7) Creating a PLC Folder for USB Connection* in *4.4.5 USB Interface* to create a new PLC folder for the CPU-02 Modules. However, specify any address other than the local addresses that have been already used for other CPU-02 Modules.

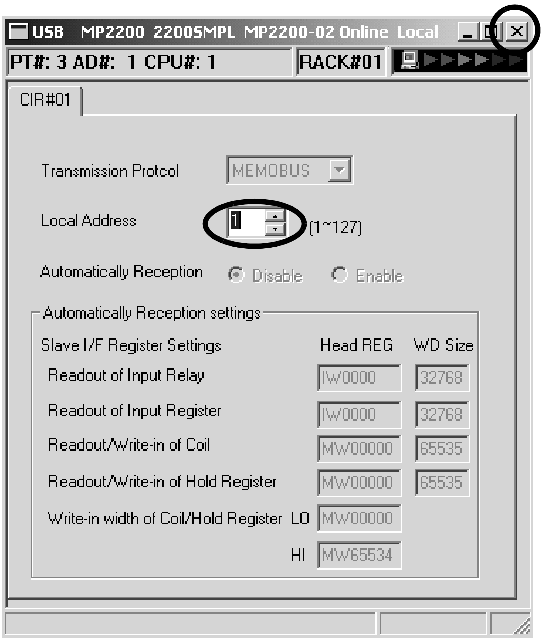
5. Go online and log-on the created PLC, and double-click the **Module Configuration** Icon in the Definition Folder to bring up the **Module Configuration definition** Window.

6. Double-click **USB** in the area of **Module Type**.



The dialog box for setting the local address will be displayed.

7. Set the same local address as specified in step 4, and then click the **Close** button.



Click the **OK** button in the dialog box to set the local address.

Note: The local address that is set here is used to write-in to the CPU-02 Module.

8. Flash-store the data and log off after returning to the **File Manager** Window.
9. Turn OFF the USB1 switch of the CPU-02 Module and then turn the power supply of the MP2200 OFF and back ON again.

The local address of the USB in the CPU-02 Module will be changed to the new address after restart of the power.

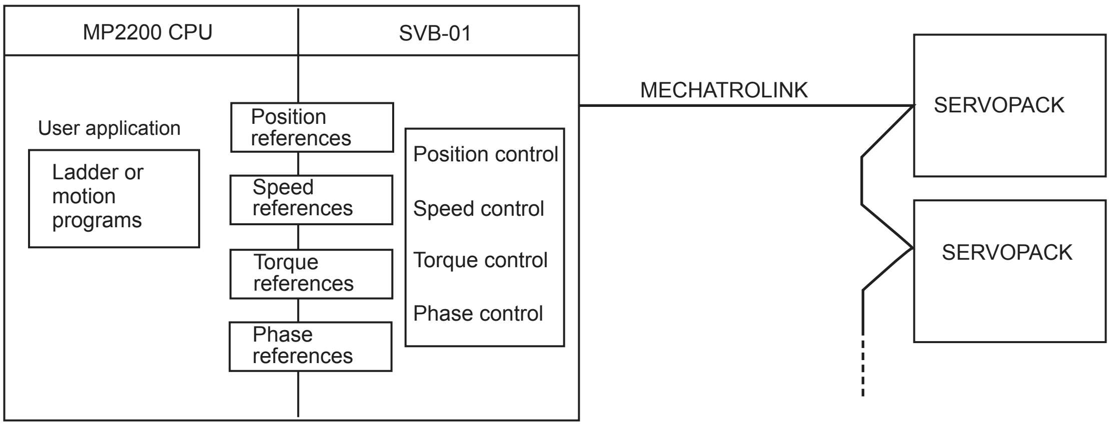
To add another CPU-02 Module, repeat the above steps 1 to 9.

4.5 SVB-01 Module

4.5.1 Outline of Functions

The SVB-01 Module is a Motion Module with a MECHATROLINK-II-compatible interface.

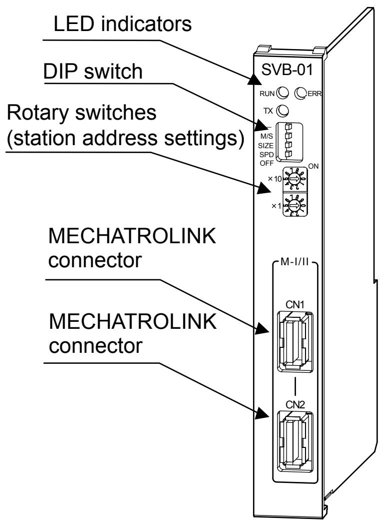
If the MECHATROLINK is used, multiple axis control is possible with less wiring. The SVB-01 Module's compatibility with MECHATROLINK-II enables position control, speed control, torque control, and phase control, and makes precise synchronous control possible. The control mode can also be changed while online, facilitating complicated machine operations.



4.5.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the SVB-01 Module.



(2) Indicators

The following table shows the indicators that show the operating status of the SVB-01 Module and error information.

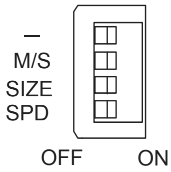
Indicators	Indicator Name	Color	Significance when Lit
RUN ○ ○ ERR TX ○	RUN	Green	Lights during normal operation of the microprocessor used for control. Not lit during error.
	ERR	Red	Lights/blinks for failures. Not lit during normal operation.
	TX	Green	MECHATROLINK transmission in progress.

(3) Switch Settings

The DIP switch sets the operating conditions for the SVB-01 Module. Use the default settings when using the Module in Master Mode.

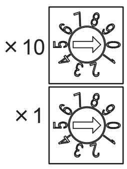
(a) DIP Switch

SIZE and SPD are valid only in Slave Mode. They will be ignored in Master Mode.



Name	Status	Operating Mode	Default Setting	Details
–	ON	Reserved	OFF	Not used.
	OFF	Reserved		
M/S	ON	Slave Mode	OFF	Select Master or Slave Mode.
	OFF	Master Mode		
SIZE	ON	17 bytes	OFF	Select the number of transfer bytes.
	OFF	32 bytes		
SPD	ON	4 Mbps	OFF	Select the baud rate.
	OFF	10 Mbps		

(b) Rotary Switches



Name	Status	Operating Mode	Default Setting	Details
×10	0 to 9	Local station address when in Slave Mode (10s digit)	0	Sets the 10s digit of the local slave address.
×1	0 to 9	Local station address when in Slave Mode (1s digit)	1	Sets the 1s digit of the local slave address.

4.5.3 Hardware Specifications

The following table shows the hardware specifications of the SVB-01 Module.

Item	Specifications
Name	Motion Modules
Model	JAPMC-MC2310
Abbreviation	SVB-01
Motion Network MECHATROLINK	Motion network: 1 channel communication ports: 2 ports SERVOPACK and I/O for up to 21 stations connectable (SERVO-PACKs for up to 16 axes) Baud rate: 4 Mbps (MECHATROLINK-1) or 10 Mbps (MECHA-TROLINK-II)
Indicators	RUN (green) ERR (red) TX (green)
Switches	– M/S (master/slave) SIZE (No. of send bytes) SPD (baud rate) × 1 (slave address) × 10 (slave address)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

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4.5.4 Function Lists

The following table shows the list of motion control functions for the SVB-01 Module.

Item			Details		
MECHATROLINK communication		Number of Communication Lines	1 line		
		Number of Communication Ports (Connectors)	2 ports		
		Terminating Resistance	JEPMC-W6022 Terminator must be purchased separately.		
		Transmission Distance	MECHATROLINK-II: Total Network length of 50 m, minimum distance between stations of 0.5 m MECHATROLINK-I: Total Network length of 50 m, minimum distance between stations of 0.3 m		
	Master Functions	Communication Interface	MECHATROLINK-II (2:N synchronous)	MECHATROLINK-I (1:N synchronous)	CP-216
		Baud Rate	10 Mbps	4 Mbps	2 Mbps or 4 Mbps
		Transmission Cycle	0.5 ms, 1 ms, 1.5 ms, or 2 ms	2 ms	1 ms, 2 ms, or 4 ms
		Number of Link Communication Bytes	17 bytes or 32 bytes	17 bytes	17 bytes
		Number of Connectable Stations	Up to 21 stations (SERVOPACK for up to 16 axes)	Up to 14 stations	Up to 14 stations
		C1 Messaging (Master Function)	Supported (selectable)	Not supported.	Not supported.
		C2 Messaging (Allocations)	Supported (selectable)	Not supported.	Not supported.
		Retry Function	Supported (selectable)	Not supported.	Not supported.
		Supported Slave Devices	For details, refer to *2.3 Devices Connectable to MECHATROLINK*.		
	Slave Functions	Communication Interface	MECHATROLINK-II (2:N asynchronous)	MECHATROLINK-I (1:N asynchronous)	–
		Baud Rate	10 Mbps	4 Mbps	–
		Communication Cycle	0.5 ms, 1 ms, 1.5 ms, or 2 ms	2 ms	–
		Number of Link Communication Bytes	17 bytes or 32 bytes	17 bytes	–
		Messaging (Slave Function)	Supported	Not supported.	–

(cont'd)

Item		Details
Servo Control	Communication Method	Single transmission (communication cycle = transmission cycle) synchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection (software) provided. Automatic recovery function not provided (recovery when alarm cleared).
	I/O Registers	Input/output using motion registers (synchronized on high-speed scan)
	Command Mode	Motion Command Mode/MECHATROLINK Transparent Command Mode
	Supported Servomotors	Standard motors, linear motors, and DD motors
	Control Type	Position control, speed control, torque control, and phase control
	Motion Commands	Positioning, External Positioning, Zero Point Return, Interpolation, Interpolation with Position Detection, Fixed Speed Feed, Fixed Length Feed, Speed Reference*, Torque Reference*, Phase Control*, etc.
	Acceleration/Deceleration Method	One-step asymmetric trapezoidal acceleration/deceleration, exponential acceleration/deceleration filter, moving average filter
	Position Unit	pulse, mm, inch, degree
	Speed Unit	Reference units/s, 10^n reference units/min, percentage of rated speed
	Acceleration Unit	Reference units/s^2, ms (acceleration from 0 until rated speed reached)
	Torque Unit	Percentage of rated torque
	Electronic Gear	Supported
	Position Control Method	Finite length position control, infinite length position control, absolute system infinite length position control, and simple absolute system infinite length position control
	Software limit	Positive/negative direction for each point
	Zero Point Return Method	13 types
	Servo Parameter Management	Parameters can be managed in the MPE720's SERVOPACK Parameter Window.
Inverter Control	Communication Method	Single transmission (communication cycle = transmission cycle) asynchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection not provided. Automatic recovery function provided.
	I/O Registers	Input/output using motion registers (synchronized on high-speed scan) CP-216 communication: Input/Output using I/O registers
	Command Mode	Motion Command Mode/MECHATROLINK Transparent Command Mode
	Control Type	Speed control only (V/F, vector control and other control methods use inverter settings)
	Motion Commands	Inverter I/O control, etc.
	Speed Unit	The speed unit depends on the inverter settings.
	Inverter Parameter Management	Parameters can be managed in the MPE720's Inverter Parameter Window.
I/O Control	Communication Method	Single transmission (communication cycle = transmission cycle) asynchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection not provided. Automatic recovery function provided.
	I/O Registers	Input/output using I/O registers and synchronized on the high-speed scan or low-speed scan (selectable).
Self-configuration Function		Module and slave devices can be automatically allocated.
Synchronization between Modules		Synchronization supported (enabled when power is cycled) when high-speed scan cycle = communication cycle times n

* Only with MECHATROLINK-II

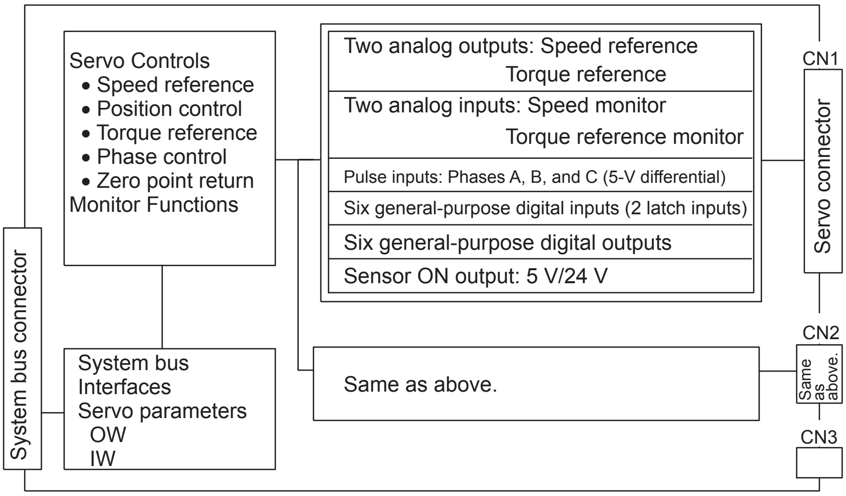
4.6 SVA-01 Module

4.6.1 Outline of Functions

The SVA-01 Module is a Motion Control Module with analog outputs. Servo drives or inverters for up to 2 axes can be controlled with a single Module.

The Module provides two connectors (CN1 and CN2) to connect SERVOPACKs and external I/O. Each connector provides analog outputs for a speed reference and torque reference, analog inputs for feedback speed monitoring and torque monitoring, pulse input phases A/B/C (5-V differential), and general-purpose digital I/O.

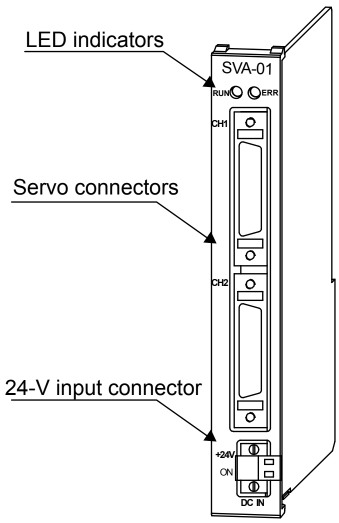
The control cycle is fixed at 500 μs to enable high-precision control regardless of the high-speed scan cycle.



4.6.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the SVA-01 Module.



(2) Indicators

The following table shows the indicators that show the operating status of the SVA-01 Module and error information.

Indicators	Indicator Name	Color	Significance When Lit
RUN ◯ ◯ ERR	RUN	Green	Lights when control microprocessor is operating normally. Not lit during error.
	ERR	Red	Lights/blinks for failures. Not lit during normal operation.

4.6.3 Hardware Specifications

The following table shows the hardware specifications of the SVA-01 Module.

Item		Specifications
Name		Motion Modules
Model		JAPMC-MC2300
Abbreviation		SVA-01
Servo interface	Digital inputs	6 inputs × 2 channels (source mode/sink mode inputs, 24 V/4.3 mA) DI_0: General-purpose input (ALM) DI_1: General-purpose input (RDY) DI_2: General-purpose input (ZERO: External latch signal input) DI_3: General-purpose input DI_4: General-purpose input DI_5: General-purpose input (EXT: External latch signal input)
	Digital outputs	6 outputs × 2 channels (sink mode outputs, 24 V/100 mA) DO_0: General-purpose output (SV_ON) DO_1: General-purpose output (ALM_RST) DO_2: General-purpose output (PCON): Used as the C-SEL (control mode select) signal. DO_3: General-purpose output DO_4: General-purpose output DO_5: General-purpose output (SEN signal): 5-V and 24-V outputs
	Pulse inputs	1 input × 2 channels, phases A/B/C, 5-V differential input, pulse rate: 4 Mpps (16 Mpps for × 4)
	Analog outputs	2 outputs × 2 channels, −10 to 10 V, D/A 16 bits
	Analog inputs	2 inputs × 2 channels, −10 to 10 V (applicable: −9.9 V to 9.9 V), A/D 16 bits
Connectors		CN1: Servo connector CN2: Servo connector CN3: 24-V input
Indicators		RUN (Green) ERR (Red)
Electrical operating conditions	Noise Resistance	Conforms to EN 61000-6-2 and EN 55011 (Group1 ClassA). Power supply noise (FT noise): 2 Kv min., for one minute Radiation noise (FT noise): 1 Kv min., for one minute Ground noise (impulse noise): 1 Kv min., for 10 minutes Electrostatic noise (air discharge method): 8 Kv min., 10 times
Dimensions (mm)		125 × 95 (H × D)
Mass		80 g

4.6.4 Function Lists

The following table shows the SVA-01 Module motion control functions.

Item		Details	
Control functions	Torque Reference (Open Loop)	Torque Reference	According to the torque unit selection parameter.
		Speed Limit at Torque Reference	Rated speed percentage designation [0.01%]
	Speed Reference (Open Loop)	Speed Reference	According to the speed unit selection parameter.
		Acceleration	According to the acceleration unit selection parameter.
		Deceleration	According to the acceleration unit selection parameter.
		Moving Average Filter Time Constant Setting	ms
		Torque Limits	According to the torque unit selection parameter.
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]
	Position Control	Position References	mm, inch, deg, pulse
		Speed References	According to the speed unit selection parameter.
		Acceleration	According to the acceleration unit selection parameter.
		Deceleration	According to the acceleration unit selection parameter.
		Filter Type	Moving average or exponential acceleration/deceleration
		Filter Time Constant	ms
		Position Compensation	mm, inch, deg, pulse
		Speed Compensation	According to the speed unit selection parameter.
		Position Loop Gain	1/s
		Position Loop Integration Time Constant	ms
		Speed Feed Forward Compensation	Position derivative percentage designation
		Primary Delay Time Constant	ms
		Torque Limit	Rated torque percentage designation [0.01%]
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]
	Phase Control	Speed References	According to the speed unit selection parameter.
		Speed Compensation	According to the speed unit selection parameter.
		Phase Compensation	mm, inch, deg, pulse
		Phase Control Proportional Gain	Same as position loop gain parameter.
		Phase Control Integral Time Constant	Same as position loop integral time constant parameter.
		Torque Limit	Rated torque percentage designation [0.01%]
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]

(cont'd)

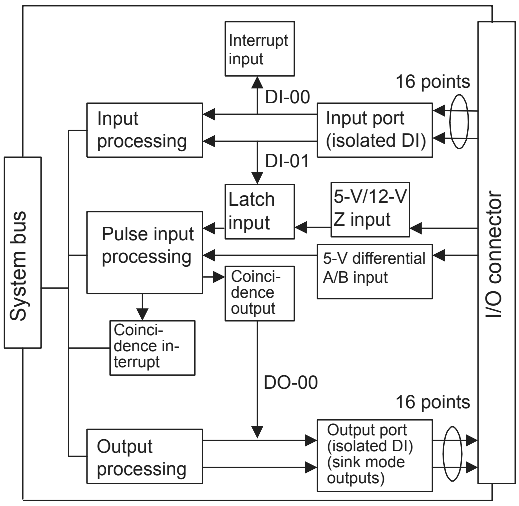
Item		Details
Motion Functions	Motion Commands	Positioning, external positioning, zero point return, interpolation, interpolation with position detection function, JOG operation, STEP operation, speed references, torque references, phase control, etc.
	Acceleration/Deceleration Method	1-step asymmetrical trapezoidal acceleration/deceleration, exponential acceleration/deceleration filter, moving average filter
	Position Units	pulse, mm, inch, degree
	Speed Units	Reference unit/s, 10^n reference unit/min, rated speed percentage designation
	Acceleration Units	Reference unit/s^2, ms (acceleration time from 0 to rated speed)
	Torque Units	Rated torque percentage designation
	Electronic Gear	Yes
	Position Control Method	Finite length position control, infinite length position control, absolute infinite length position control, simple absolute infinite length position control
	Software Limits	1 each in forward and reverse directions
	Home Return Types	17
	Latch Function	Phase-C latch, external signal input latch
Self-configuration Function		Automatic allocation by Module is supported.

4

4.7 LIO-01 Module

4.7.1 Outline of Functions

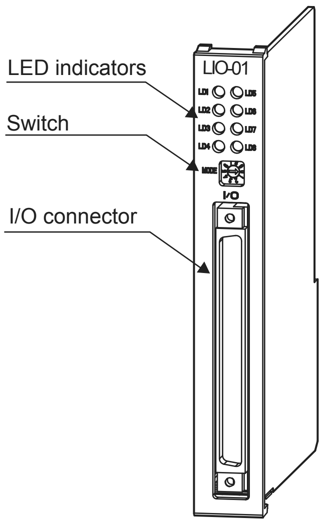
The LIO-01 Module provides digital I/O and pulse counter functions. There are 16 digital inputs (DI) and 16 digital outputs (DO) (sink mode outputs) for the digital I/O function. There is also 1 pulse input (PI) channel for the pulse counter function. I/O is refreshed on a fixed cycle for the digital I/O and pulse counter functions, occurring every MP2200 high-speed and low-speed scan. The following diagram gives an outline of the LIO-01 Module functions.



4.7.2 LED Indicators and Switch Settings

(1) External Appearance

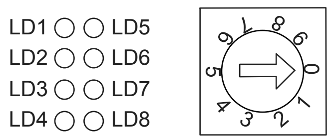
The following figure shows the external appearance of the LIO-01 Module.



(2) LED Indicators and Switch Settings

The LIO-01 Module status display LED indicators (LD1 to LD8) change based on the SW1 rotary switch setting. The following table shows the ON/OFF indicator display for DI and DO.

Indi-cator	Color	SW1	Status when Lit			
LD1 to LD8	Green	0	Board Status Indicators			
			LD1	Normal operation: Lit, Error: Not lit		
			LD2	DI-00 to DI-07 status. Lit when any DI is turned ON.		
			LD3	DO-00 to DO-07 status. Lit when any DO is turned ON.		
			LD4	Pulse A/B input. Lit when phase A/B is turned ON.		
			LD5	Normal operation: Lit, Error: Not lit		
			LD6	DI-08 to DI-15 status. Lit when any DI is turned ON.		
			LD7	DO-08 to DO-15 status. Lit when any DO is turned ON.		
			LD8	Pulse Z input. Lit when phase Z is turned ON.		
		1	DI input indicators: When DI00 to DI07 turn ON, corresponding indicators (LD1 to LD8) are lit.			
		2	DI input indicators: When DI08 to DI15 turn ON, corresponding indicators (LD1 to LD8) are lit.			
		3	DO output indicators: When DO00 to DO07 turn ON, corresponding indicators (LD1 to LD8) are lit.			
		4	DO output indicators: When DO08 to DO15 turn ON, corresponding indicators (LD1 to LD8) are lit.			
		5	PI Input Indicators			
			LD1	Pulse A input	LD5	Coincidence detection
			LD2	Pulse B input	LD6	Phase-Z latch
			LD3	Pulse Z input	LD7	DI latch
			LD4	–	LD8	–



Indicators SW1

4.7.3 Hardware Specifications

(1) Module Specifications

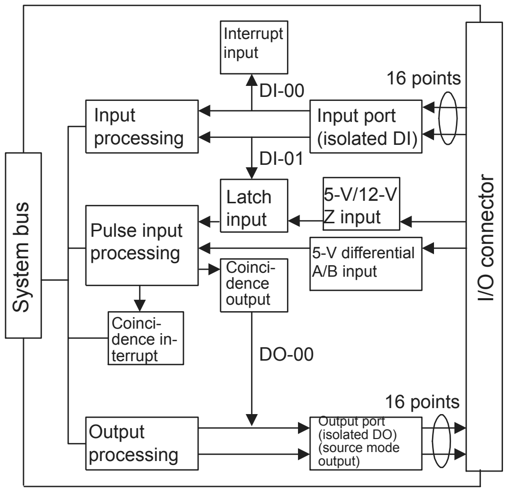
The following table shows the hardware specifications of the LIO-01 Module.

Item	Specifications
Name	LIO-01
Model	JAPMC-IO2300
Digital Inputs	16 inputs 24 VDC, 4.1 mA, combined sink mode/source mode inputs (DI-00 also used for interrupts, DI-01 also used for pulse latch inputs.)
Digital Outputs	16 outputs 24 VDC transistor open-collector outputs, sink mode outputs (DO-00 also used for coincidence outputs.)
Pulse Input	Phase A/B/Z inputs Phase-A/B: 5-V differential input, not isolated, max. frequency: 4 MHz Phase-Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz Latch input Pulse latch on phase-Z or DI-01.
Indicators	LD1 (green) LD2 (green) LD3 (green) LD4 (green) LD5 (green) LD6 (green) LD7 (green) LD8 (green)
Switches	Rotary switch (SW1)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

4.8 LIO-02 Module

4.8.1 Outline of Functions

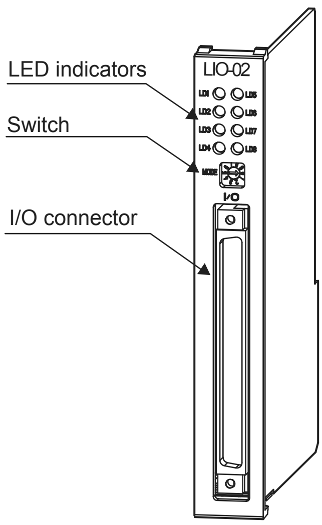
The LIO-02 Module provides digital I/O and pulse counter functions. There are 16 digital inputs (DI) and 16 digital outputs (DO) (source mode outputs) for the digital I/O function. There is also 1 pulse input (PI) channel for the pulse counter function. I/O is refreshed on a fixed cycle for the digital I/O and pulse counter functions, occurring every MP2200 high-speed and low-speed scan. The following diagram gives an outline of the LIO-02 Module functions.



4.8.2 LED Indicators and Switch Settings

(1) External Appearance

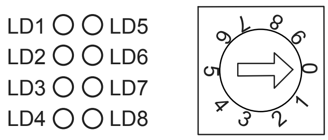
The following figure shows the external appearance of the LIO-02 Module.



(2) LED Indicators and Switch Settings

The LIO-02 Module status display LED indicators (LD1 to LD8) change based on the SW1 rotary switch settings. The following table shows the ON/OFF indicator display for DI and DO.

<table>
<tr><th>Indicator</th><th>Color</th><th>SW1</th><th colspan="4">Status when Lit</th></tr>
<tr><td rowspan="16">LD1 to LD8</td><td rowspan="16">Green</td><td rowspan="9">0</td><td colspan="4">Board Status Indicators</td></tr>
<tr><td>LD1</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD2</td><td colspan="3">DI-00 to DI-07 status. Lit when any DI is turned ON.</td></tr>
<tr><td>LD3</td><td colspan="3">DO-00 to DO-07 status. Lit when any DO is turned ON.</td></tr>
<tr><td>LD4</td><td colspan="3">Pulse A/B input. Lit when phase A/B is turned ON.</td></tr>
<tr><td>LD5</td><td colspan="3">Normal operation: Lit, Error: Not lit</td></tr>
<tr><td>LD6</td><td colspan="3">DI-08 to DI-15 status. Lit when any DI is turned ON.</td></tr>
<tr><td>LD7</td><td colspan="3">DO-08 to DO-15 status. Lit when any DO is turned ON.</td></tr>
<tr><td>LD8</td><td colspan="3">Pulse Z input. Lit when phase Z is turned ON.</td></tr>
<tr><td>1</td><td colspan="4">DI input indicators: When DI00 to DI07 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>2</td><td colspan="4">DI input indicators: When DI08 to DI15 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>3</td><td colspan="4">DO output indicators: When DO00 to DO07 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td>4</td><td colspan="4">DO output indicators: When DO08 to DO15 turn ON, corresponding indicators (LD1 to LD8) are lit.</td></tr>
<tr><td rowspan="3">5</td><td colspan="4">PI input Indicators</td></tr>
<tr><td>LD1
LD2
LD3
LD4</td><td>Pulse A input
Pulse B input
Pulse Z input
–</td><td>LD5
LD6
LD7
LD8</td><td>Coincidence detection
Phase-Z latch
DI latch
–</td></tr>
</table>



Indicators SW1

4.8.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the LIO-02 Module.

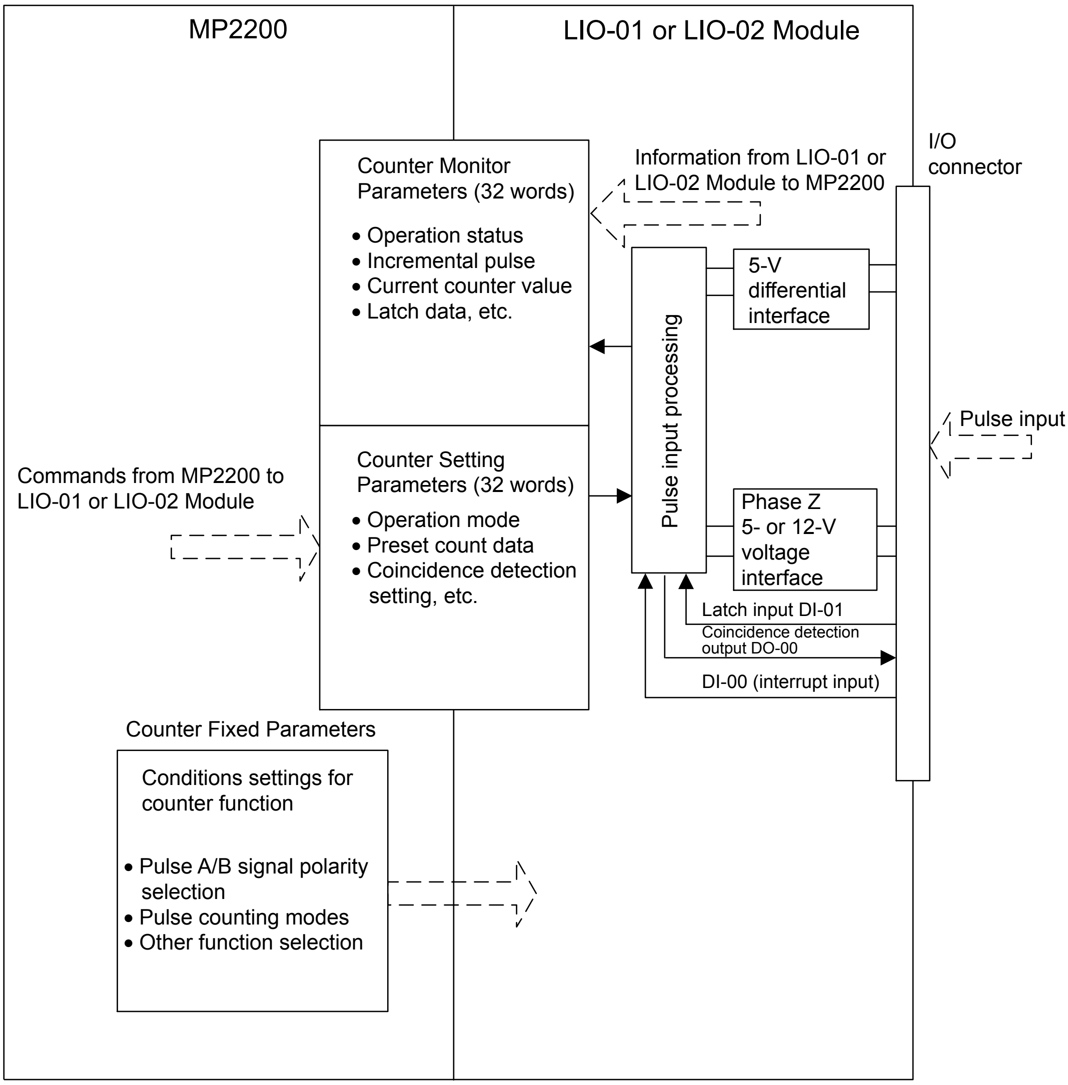
Item	Specifications
Name	LIO-02
Model	JAPMC-IO2301
Digital Inputs	16 inputs 24 VDC, 4.1 mA, combined sink mode/source mode inputs (DI-00 also used for interrupts, DI-01 also used for pulse latch inputs.)
Digital Outputs	16 outputs 24 VDC transistor open-collector outputs, source mode outputs (DO-00 also used for coincidence outputs.)
Pulse Input	Phase A/B/Z inputs Phase AB: 5-V differential input, not isolated, max. frequency: 4 MHz Phase-Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz Latch input Pulse latch on phase-Z or DI-01.
Indicators	LD1 (green) LD2 (green) LD3 (green) LD4 (green) LD5 (green) LD6 (green) LD7 (green) LD8 (green)
Switches	Rotary switch (SW1)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

4.9 LIO-01 and LIO-02 Module Counter Functions

4.9.1 Outline of Functions

For the counter function, the command is selected in the counter fixed parameters and counter setting parameters, and status and the counter value are stored in counter monitor parameters.

The following diagram shows the data flow for the counter function.



- Pulse Counting Modes

The following pulse counting modes can be selected using the setting of the Pulse Counting Mode counter fixed parameter.

Pulse Counting Mode		Polarity	Up Count (Forward)	Down Count (Reverse)
Sign	×1	Positive logic	Pulse A Pulse B LOW	Pulse A Pulse B HIGH
		Negative logic	Pulse A Pulse B HIGH	Pulse A Pulse B LOW
	×2	Positive logic	Pulse A Pulse B LOW	Pulse A Pulse B HIGH
		Negative logic	Pulse A Pulse B LOW	Pulse A Pulse B LOW
UP/DOWN	×1	Positive logic	Pulse A Pulse B Fixed on LOW or HIGH	Pulse A Fixed on LOW or HIGH Pulse B
		Negative logic	Pulse A Pulse B Fixed on LOW or HIGH	Pulse A Fixed on LOW or HIGH Pulse B
	×2	Positive logic	Pulse A Pulse B Fixed on LOW or HIGH	Pulse A Fixed on LOW or HIGH Pulse B
		Negative logic	Pulse A Pulse B Fixed on LOW or HIGH	Pulse A Fixed on LOW or HIGH Pulse B
A/B	×1	Positive logic	Pulse A Pulse B	Pulse A Pulse B
		Negative logic	Pulse A Pulse B	Pulse A Pulse B
	×2	Positive logic	Pulse A Pulse B	Pulse A Pulse B
		Negative logic	Pulse A Pulse B	Pulse A Pulse B
	×4	Positive logic	Pulse A Pulse B	Pulse A Pulse B
		Negative logic	Pulse A Pulse B	Pulse A Pulse B

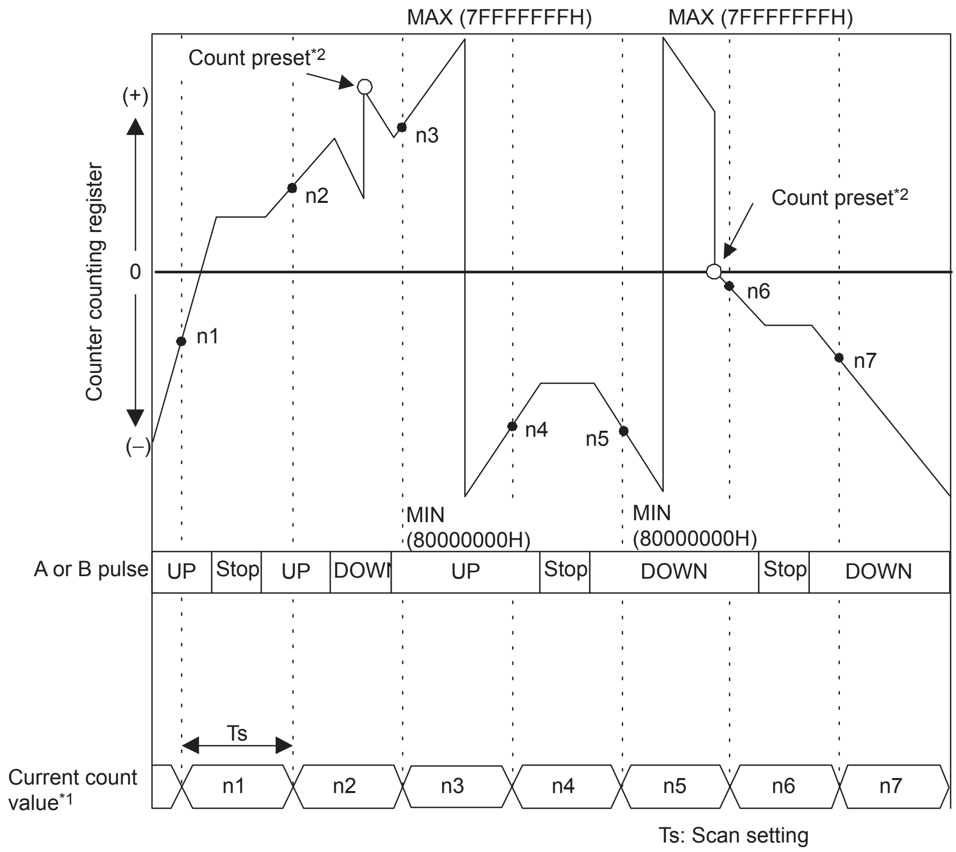
4.9.2 Counter Function Details

(1) Pulse Count Function

The count is incremented and decremented based on the pulse A and pulse B inputs.

The following functions are supported when specified in the counter setting parameter.

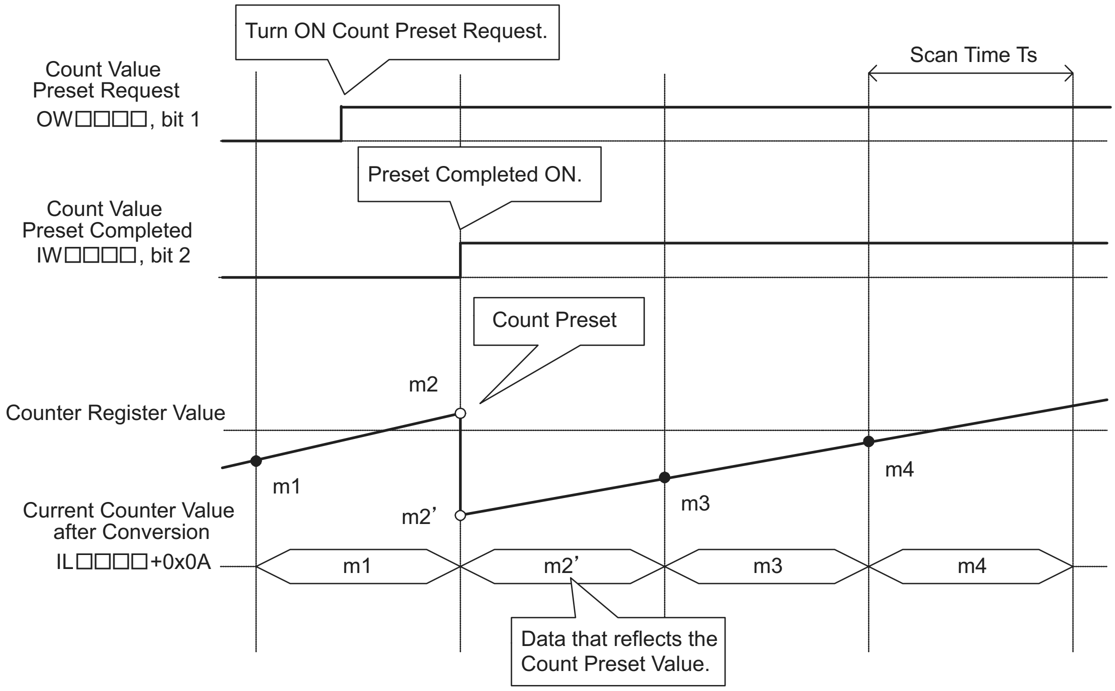
- Count prohibit: Prohibits counting.
- Count preset: Forces the counter value to change.
- PI latch detection: Saves the counter value when an external signal is input.
- Coincidence detection: Outputs an external output signal when the counter setting parameter Coincidence Detection setting and the counter current value match.



* 1. Current count value = Hardware counter (IL□□□□+4)
* 2. Count preset = Count preset data (OL□□□□+2)

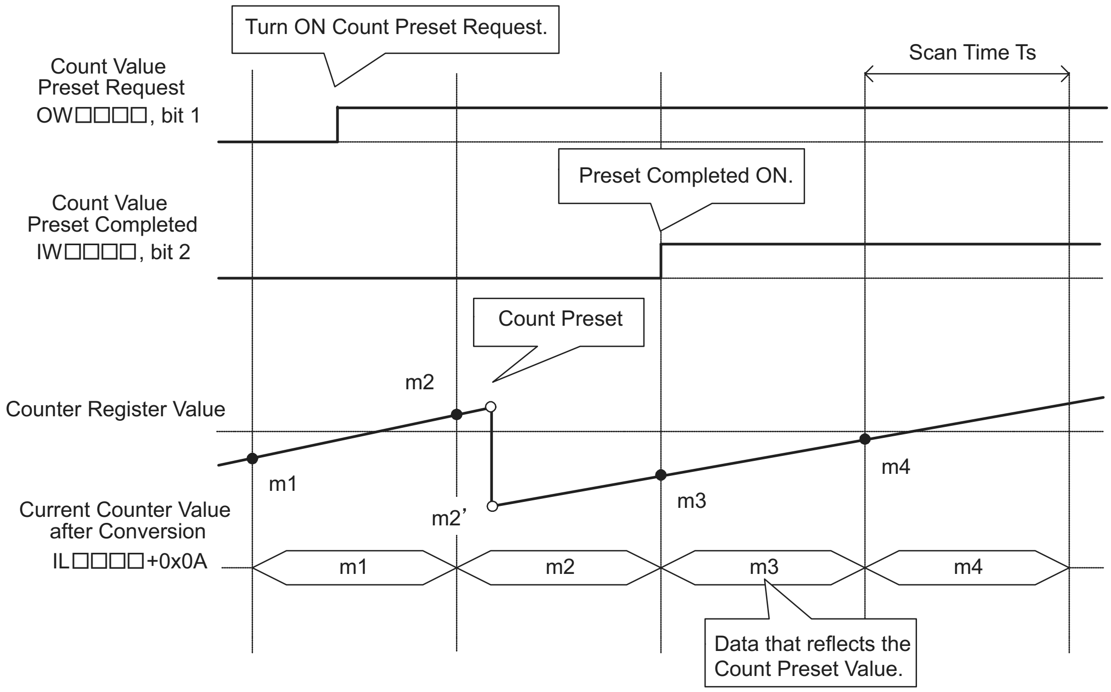
Note: □□□□: Counter fixed parameter No. 1: Leading Register Number

The timing for completing the LIO-01 Module's count preset is as follows.



INFO

The timing for completing the CNTR-01 count value preset is as follows.



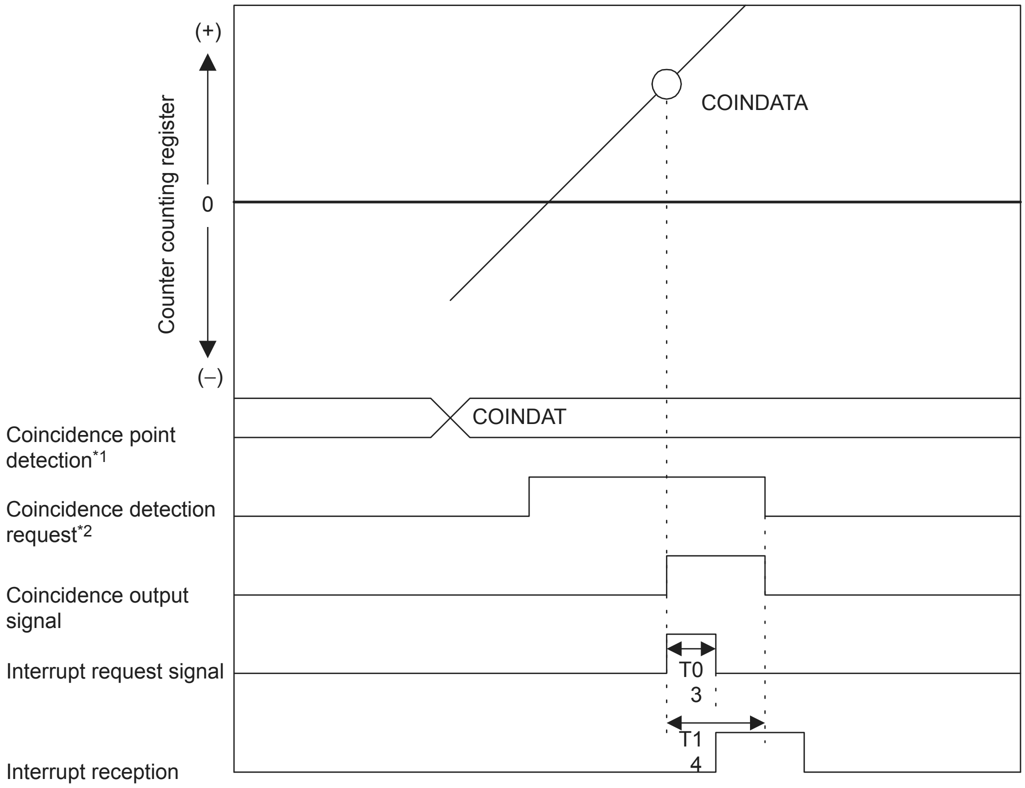
4

(2) Coincidence Output and Coincidence Interrupt Functions

The Coincidence Output and Coincidence Interrupt Functions output an external output signal (coincidence detection signal) and output an interrupt signal to the MP2200 when the current counter value and a preset counter setting parameter (Coincidence Detection Setting: OL□□□□+4) match.

The Coincidence Output Function is enabled when 1 is set to the counter fixed parameter No. 9 (Coincidence Detection Function Selection).

The Coincidence Interrupt Function is enabled when 1 is set to the counter fixed parameter No. 10 (Coincidence Interrupt Function Selection).



* 1. Coincidence point detection value = Coincidence detection setting (OL□□□□+4)
* 2. Coincidence detection request = Command setting (OW□□□□ + 0 Bit 3)
* 3. T0: Max. time from when interrupt request signal received by MP2200 until interrupt processing starts (70 to 120 ms).
* 4. TI: Time from when interrupt request signal is received until DWG.I (interrupt process drawing) execution starts.

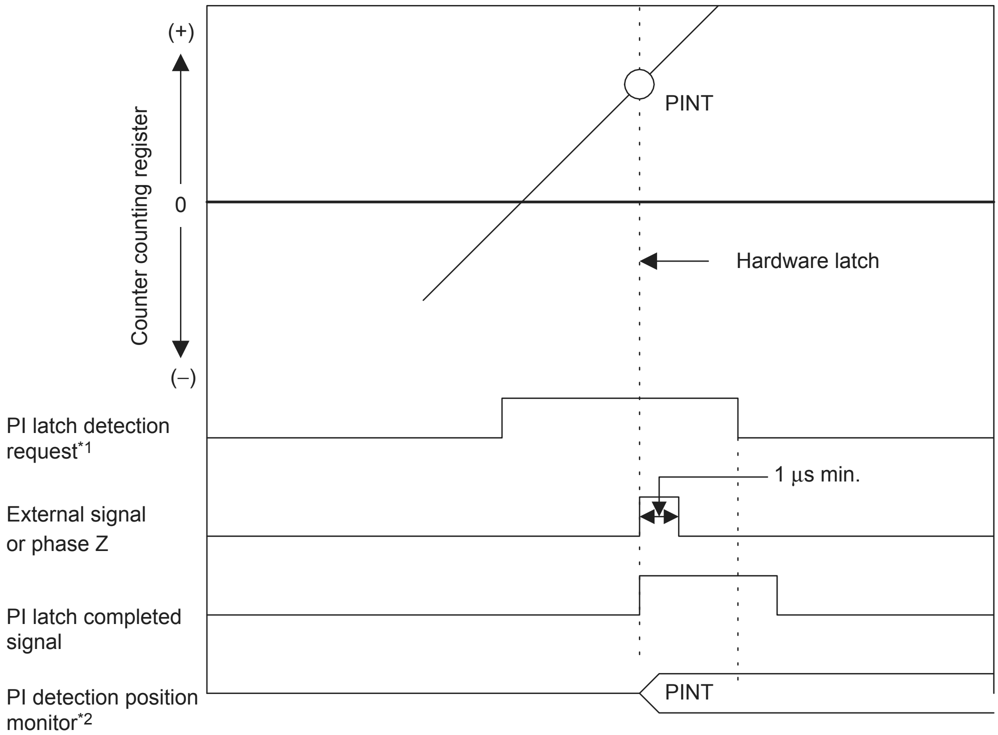
Normal program execution:	Approx. 90 to 170 ms
I/O command executed directly:	Approx. 90 to (1,460 + 40 + N) ms
	N = No. of direct I/O words (Max. 8)

IMPORTANT

- Coincidence output signal uses DO-00. Therefore, DO-00 will be masked when 1 is set to fixed parameter No. 9 (Coincidence Detection Function Selection). Actual signal outputs are not affected even if the register allocated to DO-00 is turned ON or OFF from the ladder program.
- Use counter status (IW□□□□ + 0 Bit5) to monitor coincidence detection signal outputs.

(3) PI Latch Function

The PI latch function saves (latches) the current value to a memory register on the rising edge of an external signal. Select either phase Z or a discrete input as the external signal.



* 1. PI latch detection request = Command setting (OW□□□□ + 0 Bit 2)
* 2. PI detection position monitor = PI latch data (IL□□□□ + 6)

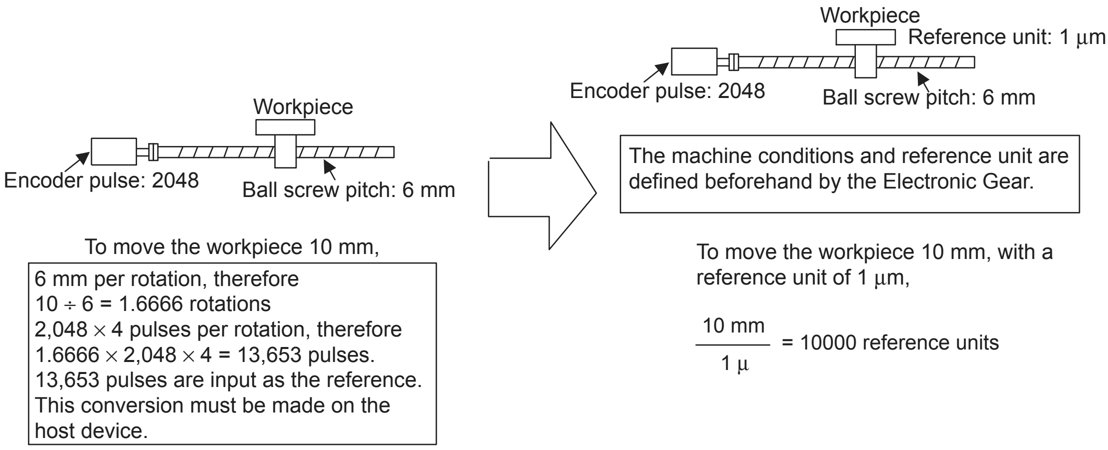
4

4.9.3 Electronic Gear Function

The Electronic Gear Function can be used when counter fixed parameter No. 15 (Reference Unit Selection) is set to any value except 0.

(1) Outline

The Electronic Gear Function is used to set the workpiece travel distance per pulse input to the LIO Module counter to any value.



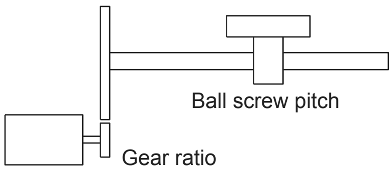
Without Electronic Gear　　　　With Electronic Gear

(2) Settings

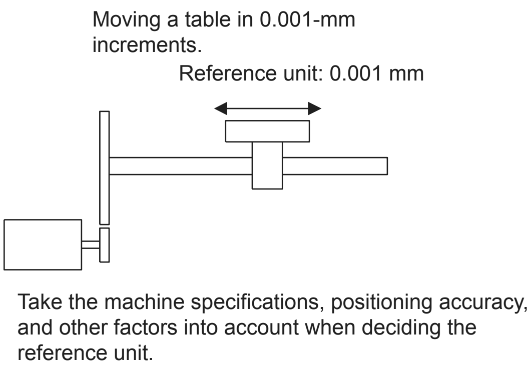
Use steps 1 to 5 in the following procedure to make the settings.

1. Confirm the machine specifications.

Elements relating to the Electronic Gear
- Gear ratio
- Ball screw pitch
- Pulley diameter, etc.



2. Confirm the number of encoder pulses input to the counter and set this value to the counter fixed parameter No. 24 (Number of Pulses Per Encoder Rotation).
3. Decide the reference unit.
   The reference unit is the smallest unit for the position data that moves the load. (The smallest reference unit used by the host device.)



◀ EXAMPLE ▶

- When reference unit is 0.01 mm, 0.001 mm, 0.1°, or 0.01 inches:
  The workpiece is moved 1 reference unit per pulse reference input.
- When reference unit is 1 µm:
  When 50,000 reference pulses are input, the workpiece will be moved by 50,000 × 1 µm = 50 mm.

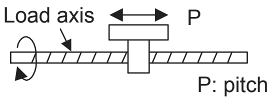
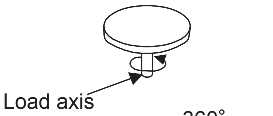
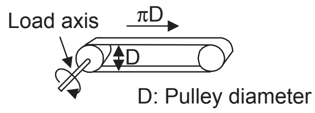
4. Find the load travel distance for each rotation of the load axis using the reference unit.

$$\text{Travel distance when load axis rotated once (reference unit)} = \frac{\text{Travel distance when load axis rotated once}}{\text{Reference unit}}$$

◀ EXAMPLE ▶

- For a ball screw pitch of 5 mm and a reference unit of 0.001 mm:

$$\frac{5}{0.001} = 5000 \text{ (Reference unit)}$$

Ball screw	Round table	Belt + pulley
 1 rotation = $\frac{P}{\text{Reference unit}}$	 1 rotation = $\frac{360^\circ}{\text{Reference unit}}$	 1 rotation = $\frac{\pi D}{\text{Reference unit}}$

5. Set the Encoder Gear Ratio and the Machine Gear Ratio in the counter fixed parameters No. 20 and No. 21.
   - No. 18 setting range: 1 to 2^{31}-1 [1 = 1 reference unit]

◀ EXAMPLE ▶

Setting Examples

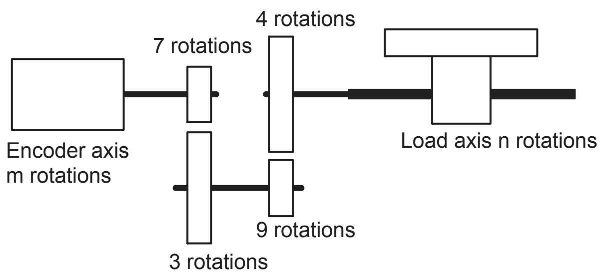
- Load moving amount per load axis rotation = 12 mm
- Smallest reference unit = 0.001 mm (reference unit: mm, to 3 decimal places)

  Counter fixed parameter No. 18 = 12 mm/0.001 mm = 12000
- When the encoder axis has rotated m times and the mechanical configuration allows the load axis to rotate n times, set the following values:

  Counter fixed parameter No. 20 = m rotations

  Counter fixed parameter No. 21 = n rotations

  Setting range: 1 to 65,535 [rotations]
- For the configuration shown in the diagram:



Gear ratio = n/m = (3/7) × (4/9) = 4/21

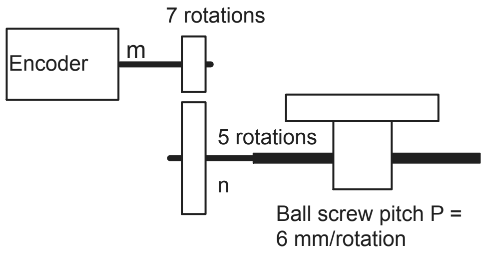
Therefore, set the following values: Counter fixed parameter No. 20 = 21

Counter fixed parameter No. 21 = 4

(3) Setting Example

The following are parameter setting examples for each kind of load mechanical configuration.

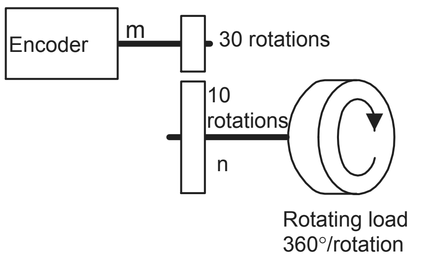
(a) Ball Screws



In the above machine system, if the requirement is reference unit = output unit = 0.001 mm, the setting of each parameter will be as follows:

- No. 18 = 6 mm/0.001 mm = 6000
- Gear ratio = n/m = 5/7
- No. 20 = 7
- No. 21 = 5

(b) Rotating Loads



In the above machine system, if the requirement is reference unit = output unit = 0.1°, the setting of each parameter will be as follows:

- No. 18 = 360°/0.1° = 3600
- Gear ratio = n/m = 10/30 = 1/3
- No. 20 = 3
- No. 21 = 1

(4) Axis Type Selection

There are two types of axis: An infinite length axis that resets the current value with a specified value, and a finite length axis that does not reset the current value. The finite length axis is used for rotation in one direction only, where the current value data is not reset after rotation, and for return and other operations that are performed only within a specified range.

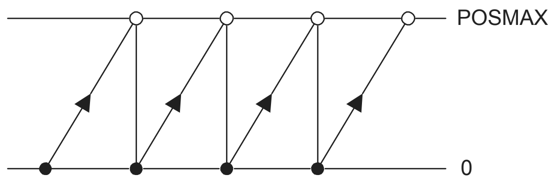
The infinite length axis is used for applications such as resetting the current value data for a conveyor belt or other device to 0 after one rotation.

If the infinite length axis is selected, the counter current value after conversion (IL□□□□ + 0x0A) and the PI latch data after conversion (IL□□□□ + 0x0C) are reported within the range 0 to (infinite axis reset position - 1).

The axis type selection sets which type of position control is to be used. The axis type selection is set in the counter fixed parameter No. 14 (Axis Type Selection).

Types	Axis Type Selection
Within a set range	Finite length axis (= 0)
No reset after 1 rotation	Finite length axis (= 0)
Reset after 1 rotation*	Infinite length axis (= 1)

* The reset position is set in the counter fixed parameter No. 22 (Infinite Length Axis Reset Position) (POSMAX).



4.9.4 Counter Parameters

(1) Counter Fixed Parameters

The following table lists the counter fixed parameters.

Parameter No.	Name	Details	Size	Default Value	Remarks
0	Channel Selection	Used (= 1)/ Not used (= 0)	1 word	0	
1	Leading Register Number	Specifies the first I/O register to use.	1 word	0	
2	Not used		1 word	0	
3	Not used		1 word	0	
4	Pulse A/B Signal Polarity Selection	Positive logic (= 0)/ Negative logic (= 1)	1 word	0	
5	Not used		1 word	0	
6	Pulse Count Mode Selection	Specifies the pulse count mode. 0: Sign mode ×1 1: Sign mode ×2 2: Up/Down mode ×1 3: Up/Down mode ×2 4: Pulse A/B mode ×1 5: Pulse A/B mode ×2 6: Pulse A/B mode ×4	1 word	6	
7	Not used		1 word	0	
8	Not used		1 word	0	
9	Coincidence Detection Function Selection	Not used (= 0)/ Used (= 1)	1 word	0	
10	Coincidence Interrupt Function Selection	Not used (= 0)/ Used (= 1)	1 word	0	Valid only when the Coincidence Detection Function is enabled.
11	Not used		1 word	0	
12	Not used		1 word	0	
13	Not used	Not used (= 0)/ Used (= 1)	1 word	0	
14	Axis Type Selection	Finite length axis (= 0)/ Infinite length axis (= 1)	1 word	0	
15	Reference Unit	0: pulse 1: mm 2: deg 3: inch	1 word	0	
16	Number of Decimal Places	0 to 5 (1 = 1 digit)	1 word	3	
17	Not used		1 word	0	
18	Moving Amount Per Machine Rotation	1 to $2^{31} - 1$ (1 = 1 reference unit)	2 words	10000	
20	Encoder Gear Ratio	1 to 65535	1 word	1	
21	Machine Gear Ratio	1 to 65535	1 word	1	
22	Maximum Value of Rotary Counter (POSMAX)	1 to $2^{31}-1$ (1 = 1 reference unit)	2 words	360000	
24	Number of Pulses Per Encoder Rotation (before Multiplication)	1 to $2^{31} - 1$ (1 = 1 pulse/rev)	2 words	2048	
26	Not used		1 word	0	
to	: :				
31	Not used		1 word	0	

(2) Counter Setting Parameters

The following table shows the counter setting parameters details.

Name	Register Number	Setting Range	Meaning	Remarks
Command Settings*: (RUNMOD)	OW□□□□+0□00	Bit setting		
Function selection (Latch Detection Signal Selection) Set Function 0000H: DI latch 0002H: Z latch	OW□□□□+0□01	Bit setting		Set Function 0000H: DI latch 0002H: Z latch
Count Preset Data (PRS-DAT)	OL□□□□+0□02	-2^{31} to $2^{31}-1$	1 = 1 reference unit	
Coincidence Detection Setting (COINDAT)	OL□□□□+0□04	-2^{31} to $2^{31}-1$	1 = 1 reference unit	
Preset data of POSMAX turns	OL□□□□+0□06	-2^{31} to $2^{31}-1$	1 = 1 rotation	
Reserved	OL□□□□+0□08 to OL□□□□+0□1C			
System Monitor	OL□□□□+0x1E	-2^{31} to $2^{31}-1$		System use

* The following table shows the Command Settings (RUNMOD) details.

Name	Bit No.	Meaning
Count prohibited	0	1: Count prohibited
Count preset request	1	1: Preset request
PI latch detection request	2	1: Latch detection request
Coincidence detection request	3	1: Coincidence detection request
POSMAX turns preset request	4	1: Preset request
Reserved	5 to F	

4

(3) Counter Monitor Parameters

The following table shows counter monitor parameters details.

Name	Register Number	Range	Meaning	Remarks
Status (RUNSTS)	IW□□□□+0□00	Bit settings		
Reserved	IW□□□□+0□01			
Number of Incremental Pulses (PDV)	IL□□□□+0□02	-2^{31} to $2^{31}-1$	1 = 1 pulse	
Current Counter Value (PFB)	IL□□□□+0□04	-2^{31} to $2^{31}-1$	1 = 1 pulse	
PI Latch Data (FREQ)	IL□□□□+0□06	-2^{31} to $2^{31}-1$	1 = 1 pulse	
Number of Incremental Pulses after Conversion (PDVG)	IL□□□□+0□08	-2^{31} to $2^{31}-1$	1 = 1 reference unit	Same as number of incremental pulses when Electronic Gear not used.
Current Counter Value after Conversion (PFBG)	IL□□□□+0□0A	-2^{31} to $2^{31}-1$	1 = 1 reference unit	Same as current counter value when Electronic Gear not used.
PI Latch Data after Conversion (FREQG)	IL□□□□+0□0C	-2^{31} to $2^{31}-1$	1 = 1 reference unit	Same as PI latch data when Electronic Gear not used.
POSMAX Turn Number	IL□□□□+0□0E	-2^{31} to $2^{31}-1$	1 = 1 rotation	
Feedback Speed*	IL□□□□+0□10	-2^{31} to $2^{31}-1$	1 = reference unit/s	When Electronic Gear not used: 1 = 1 pulse/s
Reserved	IL□□□□+0□12 to IL□□□□+0□1C			
System monitor	IL□□□□+0□1E	-2^{31} to $2^{31}-1$		System use

* Calculation: A moving average of the processing results for 32 scans.

- Without Electronic Gear

  Feedback Speed (pulse/s) = (No. of incremental pulses × 1000)/Ts
- With Electronic Gear

  Feedback Speed (reference unit/s) = (No. of incremental pulses after conversion × 1000)/Ts

  TS: Scan time (ms) for counter synchronized scan.

The following table shows Status (RUNSTS) details.

Name	Bit No.	Meaning	Remarks
Data Setting Error	0	1: Data setting error	
Fixed Parameter Setting Error	1	1: Fixed parameter setting error	ON until normal write completed.
Count Value Preset Completed	2	1: Count value preset completed	
PI Latch Completed Signal	3	1: PI latch completed	
Pulse-A/B 0	4	1: Feedback pulse is ±1 or less	
Coincidence Detection Signal	5	1: Coincidence detection ON	Detected in pulse units.
Pulse-A Status Display	6	1: High	
Pulse-B Status Display	7	1: High	
Reserved	8		
Writing Fixed Parameter	9	1: Writing parameter online	ON only during writing
Phase-A or -B Disconnect Alarm	A		
Reserved	B		
POSMAX Turns Preset Completed	C	1: Completed	
Reserved	D		
Reserved	E		
Module Ready	F	1: Counter processing being executed	

4.10 LIO-04 Module

4.10.1 Outline of Functions

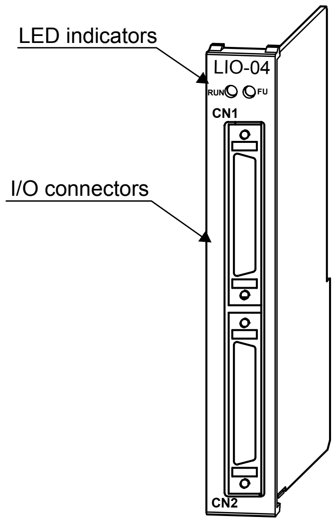
The LIO-04 Module is an Optional Board for the MP2200/MP2300 that provides a digital I/O function. There are 32 digital inputs (DI) and 32 digital outputs (DO) (sink mode outputs) for the digital I/O function.

I/O is refreshed on a fixed cycle for the digital I/O function, occurring every MP2200/MP2300 high-speed and low-speed scan.

4.10.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the LIO-04 Module.



(2) Indicators

The following table shows the status of LIO-04 Module LED indicators.

Indicator Name	Indicator Color	Status
RUN	Green	Lit: Module normal Not lit: Module error
FU	Red	Lit: One of the output protection fuses is blown. Not lit: All of the output protection fuses are normal.

Note: The burnout detection circuit will not function when there is no external 24-V power supply.

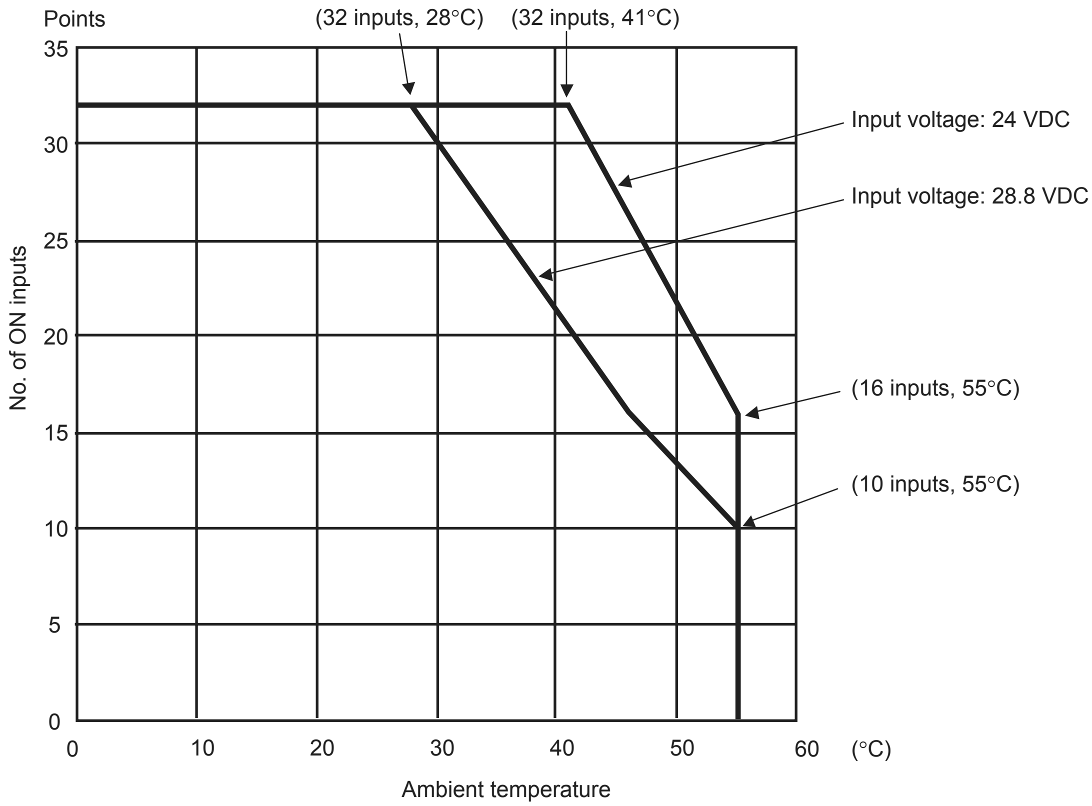
4.10.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the LIO-04 Module.

Item	Specifications
Name	LIO-04
Model	JAPMC-IO2303
Digital Inputs	32 inputs 24 VDC, 4.1 mA, combined sink mode/source mode inputs (DI-00, 01, 16, and 17 also used for interrupts.)
	Simultaneously ON Inputs 16 points (8 inputs/common): At ambient temperature of 55°C and 24 VDC 10 points (5 inputs/common): At ambient temperature of 55°C and 28.8 VDC Refer to the following characteristics graph for details.
Digital Outputs	32 outputs 24 VDC transistor open-collector outputs, sink mode outputs
Indicators	RUN (green) ERR (red)
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

* Number of ON Inputs vs Ambient Temperature Characteristic



4.11 218IF-01 Module

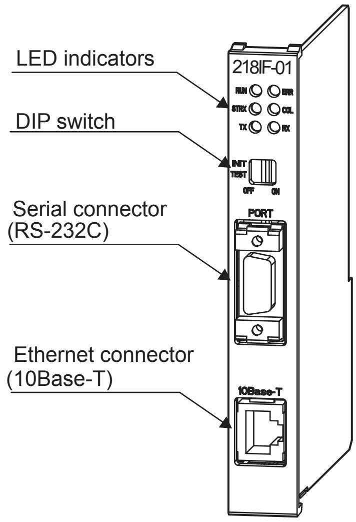
4.11.1 Outline of Functions

The 218IF-01 Module has an RS-232C serial interface and an Ethernet interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 218IF-01 Module via the PORT or 10Base-T connectors. Communication modes include message communication and engineering communication, and MEMOBUS, MELSEC, and non-procedure protocols are supported. Refer to the *MP2300 Machine Controller Communication Module Users Manual* (Manual No. SIEPC88070004) for details.

4.11.2 LED Indicators and Switch Settings

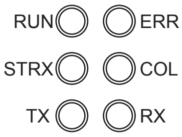
(1) External Appearance

The following figure shows the external appearance of the 218IF-01 Module.



(2) Indicators

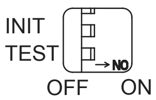
The following table shows the status of 218IF-01 Module LED indicators.



Indicator	Color	Status
RUN	Green	Lit during normal operation. Not lit during errors.
ERR	Red	Lit/blinking during malfunctions. Not lit during normal operation.
STRX	Green	Lit during RS-232C data transmission or reception. Not lit when data not being transmitted or received.
COL	Red	Ethernet collision status. Lit: Collision, Not lit: No collision
TX	Green	Ethernet transmission status. Lit during transmission. Not lit if data not being transmitted.
RX	Green	Ethernet reception status. Lit during reception. Not lit if data not being received.

(3) Switch Settings

The following table shows the 218IF-01 Module switch settings.



Label	Name	Sta-tus	Function	Factory Setting
INIT	Initial Startup	ON	For engineering communication. Starts up using default parameters (excluding automatic reception function settings.) Given higher priority than CPU Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for CPU Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation (Always leave turned OFF.)	

(4) Offline Self-diagnostic Test

The following table shows the LED indicator display if a malfunction is detected by the 218IF-01 Module during an offline self-diagnostic test. Offline diagnostic tests are executed if the TEST switch is set to ON, the INIT switch is set to OFF, and the power is turned ON.

Item	Details	LED indicators			
		RUN	ERR	TX	RX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (twice)*	Not lit	Not lit
SRAM Error	A SRAM hardware error has been detected.		Blinking (3 times)*		
CPU Interface Error	A CPU data transmission error has been detected.		Blinking (5 times)*		
Communication Error	A communication error has been detected.		Blinking (4 times)*	Depends on status.	
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)*	Depends on status.	

* Indicates the number of blinking.

4.11.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the 218IF-01 Module.

Item	Specifications
Name	218IF-01
Model	JAPMC-CM2300
Communication Ports	RS-232C 1 port (PORT)
	Ethernet 1 port (10Base-T)
Indicators	Module status LED indicators RUN (green), ERR (red), STRX (green), COL (red), TX (green), RX (green)
Switches	INIT TEST
Dimensions (mm)	125 × 95 (H × D)
Mass	85 g

(2) Communication Specifications

(a) RS-232C communication Specifications

The following table shows the RS-232C communication specifications.

Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9600 or 19200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Mode	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, Non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits, Stop bits: 1 or 2 bits, Parity: Odd, even, or none

(b) Ethernet communication Specifications

The following table shows the Ethernet communication specifications.

Item	Specifications
Interface	10Base-T: RJ-45
Isolation Method	Transformer coupled
Transmission Distance	100 m/segment, Total length: 500 m (when 4 repeaters are connected)
Baud Rate	10 Mbps
Access Mode	IEEE802.3 CSMA/CD
Frames	Ethernet, Ver.2 (DIX specifications)
Connections	TCP/UDP/IP/ARP
Max. Number of Nodes	10Base-T: 2 Units/segment.
Communication Mode	Message communication, engineering communication
Max. Number of Transmission Words	512 words (1,024 Bytes)
Communication Protocols	MEMOBUS (Slave), Extended MEMOBUS, MELSEC, MODBUS/TCP, non-procedure
Max. Number of Segments	5

4.12 217IF-01 Module

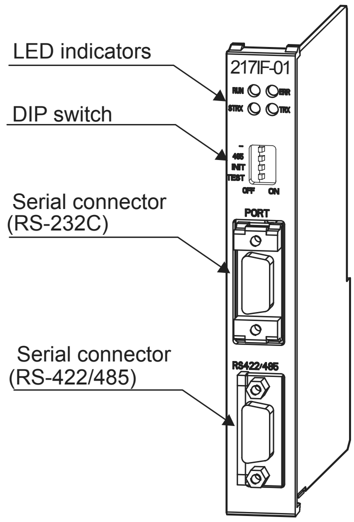
4.12.1 Outline of Functions

The 217IF-01 Module has RS-232C and RS-422/485 serial interfaces mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 217IF-01 Module via the PORT or RS-232C and RS-422/485 connectors. Communication modes include message communication and engineering communication, and MEMOBUS, MELSEC, and non-procedure protocols are supported. Refer to the *MP2300 Machine Controller Communication Module Users Manual* (Manual No. SIEPC88070004) for details.

4.12.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the 217IF-01 Module.



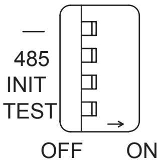
(2) Indicators

The following table shows the status of 217IF-01 Module LED indicators.

Indicator	Color	Status
RUN	Green	Lit during normal operation. Not lit during errors.
ERR	Red	Lit/blinking during malfunctions. Not lit during normal operation.
STRX	Green	Lit during RS-232C (PORT) data transmission and reception. Not lit when data not being transmitted or received.
TRX	Green	Lit during RS-422/485 (RS-422/485) data transmission and reception. Not lit when data not being transmitted or received.

(3) Switch Settings

The following table shows the 217IF-01 Module switch settings.



Label	Name	Status	Function	Factory Setting
–	Reserved	–	Always leave set to OFF.	OFF
485	485 Mode	ON	Uses the RS422/485 port as an RS-485.	OFF
		OFF	Uses the RS422/485 port as an RS-422.	
INIT	Initial startup	ON	For engineering communication. Starts up RS-232C (PORT) using default parameters (excluding automatic reception function settings.) The RS-422/485 port is disabled. Given higher priority than CPU Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for CPU Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use.	OFF
		OFF	Normal operation (Always leave turned OFF.)	

(4) Offline Self-diagnostic Test

The following table shows the LED indicator display if a malfunction is detected by the 217IF-01 Module during an offline self-diagnostic test. Offline diagnostic tests are executed if the TEST switch is set to ON, the INIT switch is set to OFF, and the power is turned ON.

Item	Details	LED Indicators			
		RUN	ERR	STRX1/ STRX2	RX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (once)*	Not lit	Depends on status.
SRAM Error	A SRAM hardware error has been detected.		Blinking (twice)*		
DPRAM Error	A DPRAM hardware error has been detected.		Blinking (3 times)*		
Communication Error	A communication error has been detected.		Blinking (4 times)*		
RS-232C Error	An RS-232C loopback error has been detected.		Blinking (5 times)*		
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)*		

* Indicates the number of blinking.

4.12.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the 217IF-01 Module.

Item	Specifications
Name	217IF-01
Model	JAPMC-CM2310
Communication Ports	RS-232C 1 port (PORT)
	RS-422/485 1 port (RS422/485)
Indicators	Module status LED indicators, RUN (green), ERR (red), STRX (green), TRX (green)
Setting Switches	—— 485 INIT TEST
Dimensions (mm)	125 × 95 (H × D)
Mass	90 g

(2) Communication Specifications

(a) RS-232C communication Specifications

The following table shows the RS-232C communication specifications.

Item	Specifications
Interface	1 port (PORT)
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9.6, 14.4, 19.2, 28.8, 38.4, 48.0, 57.6, or 76.8 kbps
Access Mode	Asynchronous (start-stop synchronization)
Communication Mode	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, OMRON, and non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

Note: The baud rate depends on the connected devices.

(b) RS-422/485 Communication Specifications

The following table shows RS-422/485 communication specifications.

Item	Specifications
Interface	1 port (RS422/485)
Connectors	MDR14 pin (female)
Transmission Distance	300 m max.
Baud Rate	9.6, 14.4, 19.2, 28.8, 38.4, 48.0, 57.6, or 76.8 kbps
Synchronization Mode	Asynchronous (start-stop synchronization)
Communication Protocols	MEMOBUS, MELSEC, non-procedure
Media Access Control Method	1:1 (RS-422) 1:N (RS-485)
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

4.13 260IF-01 Module

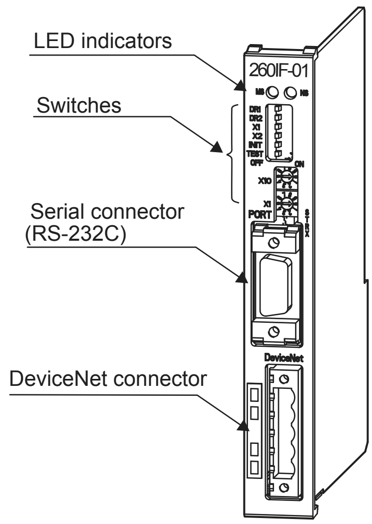
4.13.1 Outline of Functions

The 260IF-01 Module has an RS-232C serial interface and a DeviceNet interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 260IF-01 Module via the PORT or DeviceNet connectors. Communication modes include message communication and engineering communication, and MEMOBUS, MELSEC, and non-procedure protocols are supported. Refer to the MP2300 Machine Controller Communication Module Users Manual (Manual No. SIEPC88070004) for details.

4.13.2 LED Indicators and Switch Settings

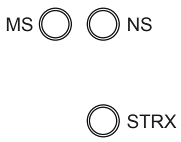
(1) External Appearance

The following figure shows the external appearance of the 260IF-01 Module.



(2) Indicators

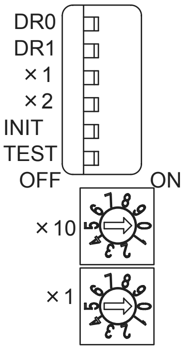
The following table shows the status of 260IF-01 Module LED indicators.



Indicator	Color	Status
MS (two-color LED)	Green	Normal operation
	Red	Module error
	Not lit	Module power supply disconnected
NS (two-color LED)	Green	Normal operation
	Green blinking	No I/O allocations while connection is being established
	Red	Error (Bus OFF, duplicated MAC ID)
	Red blinking	Communication error
	Not lit	Communication power supply disconnected, checking for duplicated MAC ID
STRX (mounted on PCB)	Green lit/blinking	Transmitting or receiving RS-232C data
	Not lit	No RS-232C data communication

(3) Switch Settings

The following table shows the 260IF-01 Module switch settings.



Label	Name	Status	Function
DR0	Baud rate setting 0	ON	Refer to setting details.
		OFF	
DR1	Baud rate setting 1	ON	
		OFF	
×1	Master/Slave Mode	ON	Used in Master Mode.
		OFF	Used in Slave Mode.
×2	Self-diagnosis (DeviceNet)	ON	Executes DeviceNet self-diagnosis when the power supply is turned ON.
		OFF	Does not execute self-diagnosis. Normally always leave turned OFF.
INIT	Initial startup	ON	For engineering communication. Starts up RS-232C (PORT) using default parameters (excluding automatic reception function settings.) Given higher priority than CPU Module Flash Startup and Self-configuration Startup.
		OFF	Set to OFF for CPU Module Flash Startup and Self-configuration Startup.
TEST	TEST	ON	System use
		OFF	Normal operation (Always leave turned OFF.)
×10	Node Address 10s Digit Setting	–	Sets the node address. (Rotary decimal switch)
×1	Node Address 1s Digit Setting	–	Sets the node address. (Rotary decimal switch)

The following table shows details of baud rate settings.

DR1	DR0	Setting
OFF	OFF	125 kbps
OFF	ON	250 kbps
ON	OFF	500 kbps
ON	ON	communication not possible.

4.13.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the 260IF-01 Module.

Item	Specifications
Name	260IF-01
Model	JAPMC-CM2320
Communication Ports	RS-232C 1 port (PORT)
	DeviceNet 1 port (DeviceNet)
Indicators	Module status LED indicators MS (green, red) NS (green, red)
Setting Switches	DR0 DR1 ×1 ×2 INIT TEST ×10 ×1
Dimensions (mm)	125 × 95 (H × D)
Mass	85 g

(2) Communication Specifications

(a) RS-232C communication Specifications

The following table shows the RS-232C communication specifications.

Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9600 or 19200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Mode	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

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(b) DeviceNet communication Specifications

The following table shows DeviceNet communication specifications.

Item		Specifications
Number of Lines		1
Supported Communication Methods		I/O communication functions (Polled Bit Strobed) Explicit messages (Master function only)
I/O Communication	Max. Number of Slaves	63 nodes
	Max. Number of I/O Bytes	2,048 bytes, 256 bytes/node for max. number of I/O bytes.
Message communication (Master only)	Max. Number of Nodes for Message	63 nodes, max. number of nodes for simultaneous communication: 8
	Max. Message Length	256 bytes
	Execution Functions	MSG-SND function
Settings		2 rotary switches on front panel: Node address
		DIP switch on front panel: Baud rate Master/Slave selection
Indicators		2 LEDs: MS, NS
Power Supply Voltage for Communication		24 VDC ±10% (supplied by special cable)
Current Consumption		Communication power supply: 45 mA max. (supplied from communication connector). Internal circuit power supply (supplied from MBU-01 Unit.)

4.14 261IF-01 Module

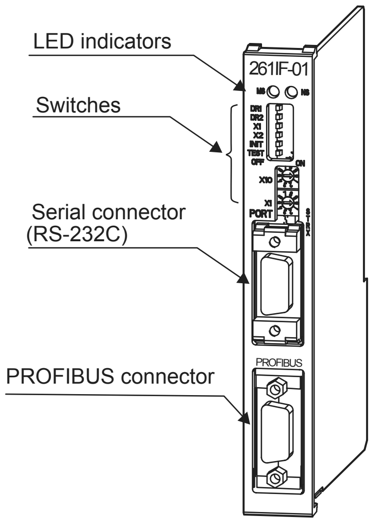
4.14.1 Outline of Functions

The 261IF-01 Module has an RS-232C serial interface and a PROFIBUS interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 261IF-01 Module via the PORT or PROFIBUS connectors. Communication modes include message communication engineering communication, and MEMOBUS, MELSEC, and non-procedure protocols are supported. Refer to the *MP2300 Machine Controller Communication Module Users Manual* (Manual No. SIEPC88070004) for details.

4.14.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the 261IF-01 Module.



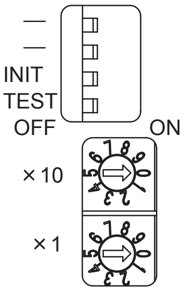
(2) Indicators

The following table shows the status of 261IF-01 Module LED indicators.

Indicator	Color	Status
RUN	Green	Lit during normal operation. Not lit during errors or during reset.
ERR	Red	Lit/blinking during malfunctions. Not lit during normal operation. Lit during reset.
STRX	Green	Lit during RS-232C data transmission or reception. Not lit when data not being transmitted or received.
TRX	Green	Lit during PROFIBUS data transmission or reception. Not lit when data not being transmitted or received.

(3) Switch Settings

The following table shows the 261IF-01 Module switch settings.



Label	Name	Status	Function	Factory Setting
–	Reserved	–	Always leave set to OFF.	OFF
–	Reserved	–		
INIT	Initial startup	ON	For engineering communication Starts up serial section using default parameters (excluding automatic reception function settings). Given higher priority than the CPU Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for CPU Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation (Always leave turned OFF.)	
×10	Node Address 10s Digit Setting	–	Sets the node address. (Rotary decimal switch)	Setting range: 1 to 64
×1	Node Address 1s Digit Setting	–	Sets the node address. (Rotary decimal switch)	

(4) Offline Self-diagnostic Test

The following table shows the LED indicator display if a malfunction is detected by the 261IF-01 Module during an offline self-diagnostic test. Offline diagnostic tests are executed if the TEST switch is set to ON, the INIT switch is set to OFF, and the power is turned ON.

Item	Details	LED Indicators			
		RUN	ERR	STRX1/ STRX2	RX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (once)*	Not lit	Depends on status.
SRAM Error	A SRAM hardware error has been detected.		Blinking (twice)*		
DPRAM Error	A DPRAM hardware error has been detected.		Blinking (3 times)*		
RS-232C Error	An RS-232C loopback error has been detected.		Blinking (5 times)*		
Station Number Error	A PROFIBUS station number error has been detected.		Blinking (6 times)*		
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)*		

* Indicates the number of blinking.

4.14.3 Hardware Specifications

(1) Module Specifications

The following table shows the hardware specifications of the 261IF-01 Module.

Item	Specifications
Name	261IF-01
Model	JAPMC-CM2330
Communication Ports	RS-232C 1 port (PORT) PROFIBUS 1 port (PROFIBUS)
Indicators	Module status LED indicators, RUN (green), ERR (red), STRX (green), TRX (green)
Setting Switches	INIT TEST × 10 × 1
Dimensions (mm)	125 × 95 (H × D)
Mass	90 g

(2) Communication Specifications

(a) RS-232C Communication Specifications

The following table shows the RS-232C communication specifications.

Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9600 or 19200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Mode	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

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(b) PROFIBUS communication Specifications

The following table shows the PROFIBUS communication specifications.

Item	Specifications
Mounted Functions	DP slave function • Cyclic communication (DP standard function)
Baud Rate	12 M, 6 M, 4 M, 3 M, 1.5 M, 750 k, 500 k, 187.5 k, 93.75 k, 19.2 k, or 9.6 kbps (Auto detect)
Configuration	Implemented by the PROFIBUS Master*1
Slave Address	1 to 64 *2
I/O Processing	• Total I/O register area: 64 words max. • I/O allocations: 64 words each max.
Diagnostic Functions	• Status and Slave status display using MPE720 • I/O error display using system register

* 1. The PROFIBUS ID is 05C1.The GSD file YASK05C1.GSD is provided for master configuration.GSD file: Defines slave information.

* 2. The PROFIBUS ID can be set between 0 and 125, but the 261IF-01 Module can be set only between 1 and 64.

4.15 EXIOIF Module

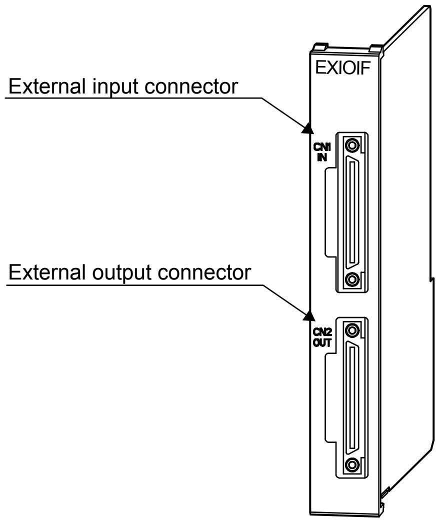
4.15.1 Outline of Functions

The EXIOIF Module is an expansion rack interface for the MP2200. This Module can be used to configure an MP2200 system with up to four racks.

4.15.2 LED Indicators and Switch Settings

(1) External Appearance

The following figure shows the external appearance of the EXIOIF Module.



4.15.3 Hardware Specifications

(1) Module Specifications

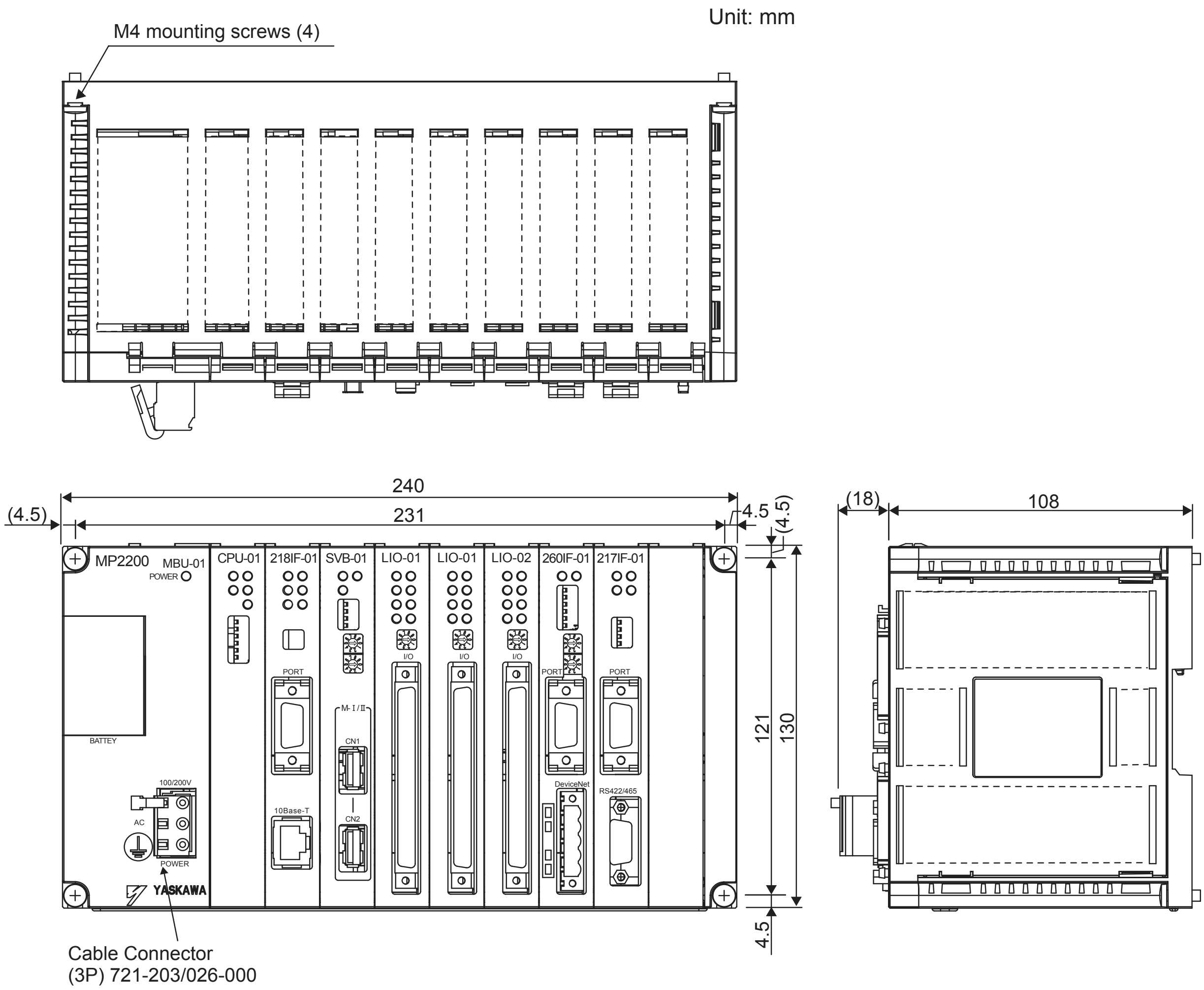
The following table shows the hardware specifications of the EXIOIF Module.

Item	Specifications
Abbreviation	EXIOIF
Model	JAPMC-EX2200
Function	Expansion rack interface (maximum 4-Rack configuration)
Expansion Bus connector	HDRA-EC68LFDT-SL (HONDA)
Expansion Bus Interface	IEEE-488 (GPIB): Equivalent to SN75160 (TI).
Rack No. recognition	The CPU Module automatically recognizes rack 1 from the expansion cable connection. When nothing is connected to the IN connector, a one-rack configuration is used. Racks 2 to 4 are in the order that racks are connected to rack 1.
Module Type	MP2200 Optional Module The EXIOIF Module is recognized as an Optional Module. It can be mounted in any slot.
Dimensions (mm)	125 × 95 (H × D)
Mass	80 g

4.16 External Appearance

4.16.1 Basic Unit

The following figure shows the external appearance of the Basic Unit.

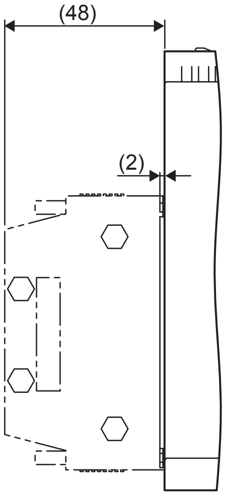


Note: 1. A 721-203/026-000 Cable Connector is mounted to the POWER connector.
2. Different Optional Modules are inserted into the slots for each product model.

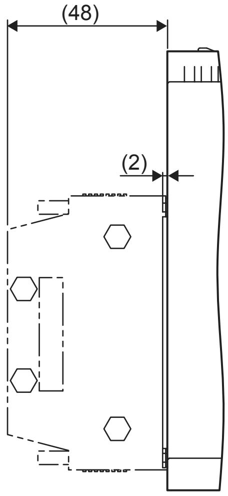
4.16.2 Mounting Optional Module Connectors

The Optional Modules have the following dimensions:
Height: 125 mm; Depth: 95 mm
The following figure shows the Optional Module connector mounting dimensions.

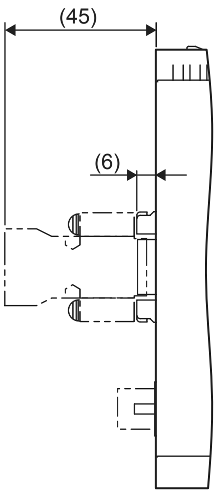
Unit: mm



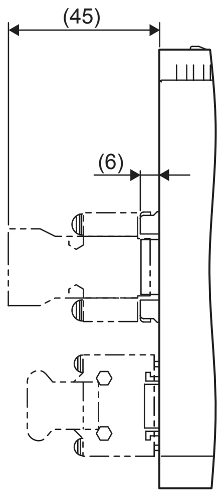
LIO-01



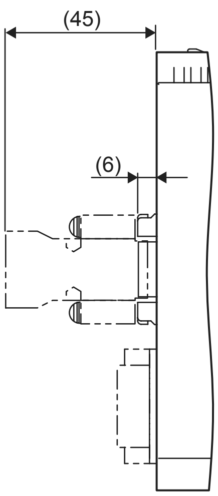
LIO-02



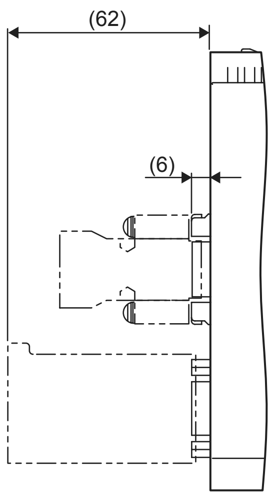
218IF-01



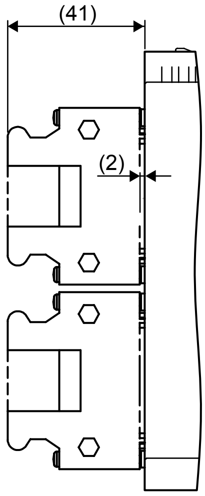
217IF-01



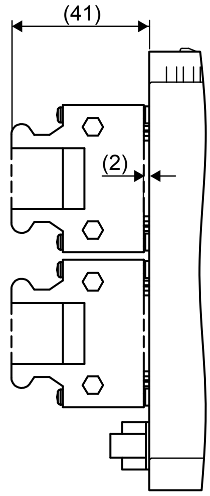
260IF-01



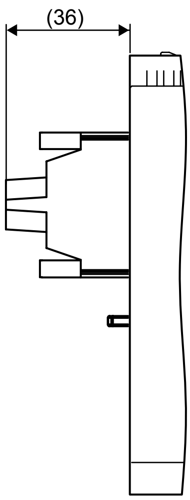
261IF-01



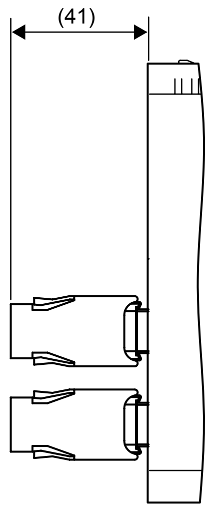
LIO-04



SVA-01



EXIOIF



SVB-01

5

Mounting and Wiring

This chapter explains how to handle the MP2200 and the connection methods for each Module.

5.1 Handling the MP2200

5.1.1 Mounting the MP2200

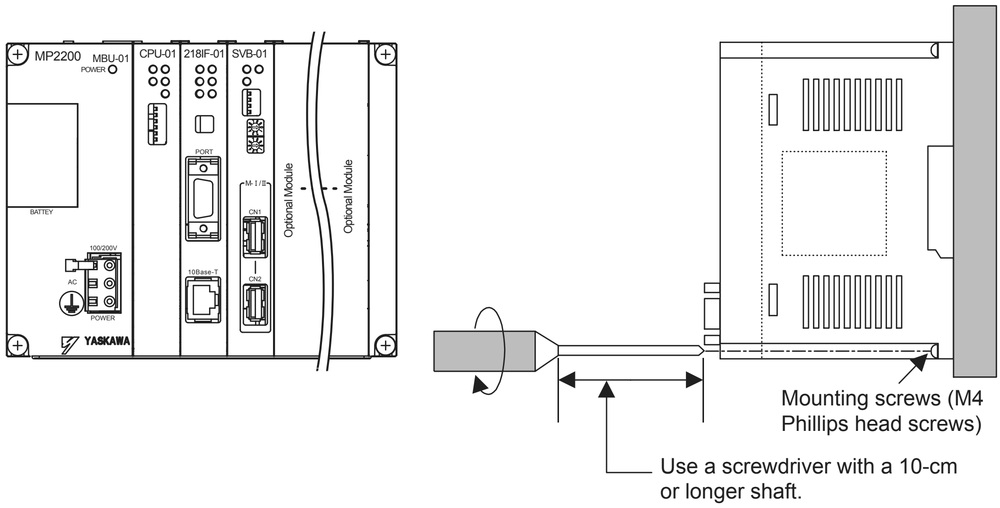
There are two methods for mounting the MP2200.

- Screw mounting
- Using DIN rail

(1) Screw Mounting

Mount the MP2200 using the following method.

Place the MP2200 against the mounting base and tighten the four mounting screws.

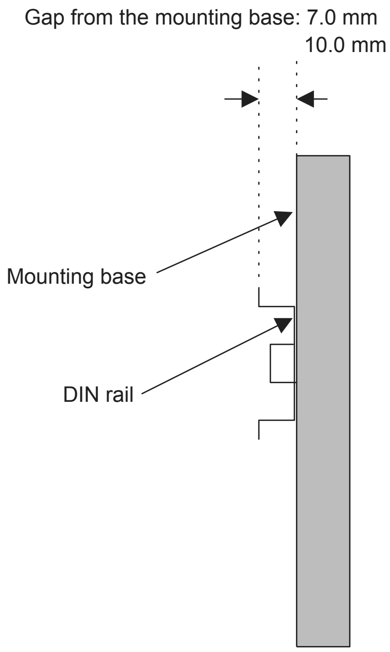


Note: Mount the MP2200 vertically on a wall, as shown in the above diagram.

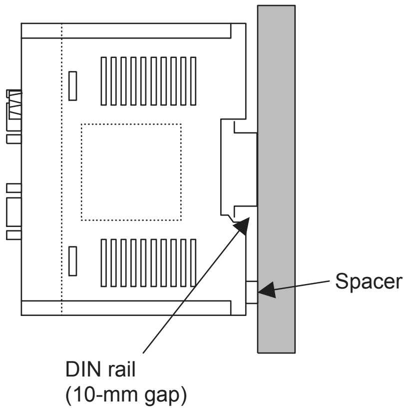
(2) Using DIN Rail

(a) Before Mounting to DIN Rail

There are two types of DIN rail, with different gaps from the mounting base, as shown in the following diagram.



When mounting the MP2200 to a DIN rail with a 10-mm gap, insert spacers behind the MP2200 to protect against vibration.



IMPORTANT

The parts for mounting the MP2200 to DIN rail are supplied separately. Purchase the following product when using DIN rail.

Product name: DIN Rail Mounting Parts

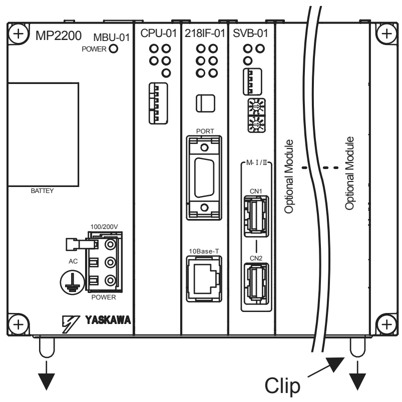
Model No.: JEPMC-OP300

(b) Procedure for Mounting to DIN Rail

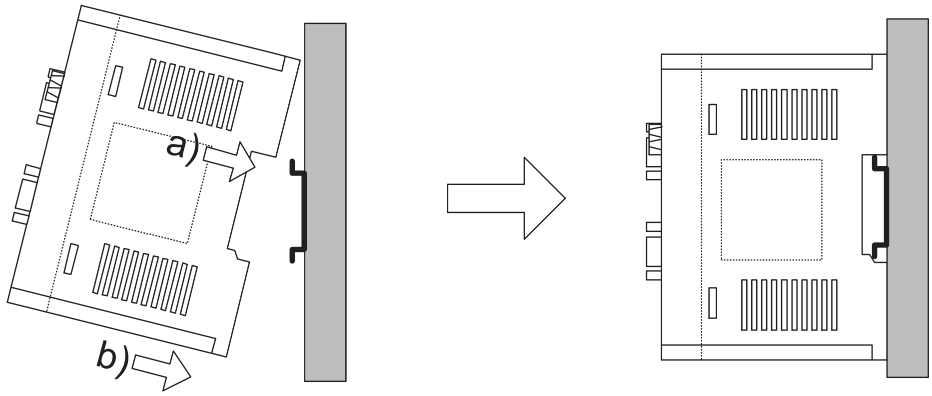
Use the following procedure to mount the MP2200 to DIN rail.

1. Release the mounting clips.

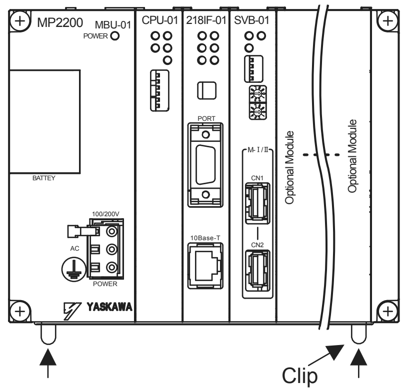
   Pull the DIN rail mounting clips down to release them.



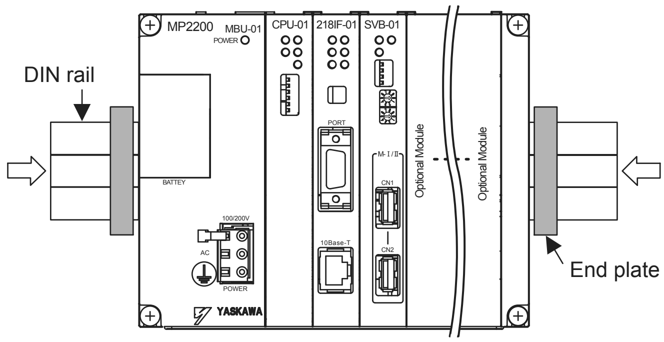
2. Mount the MP2200 to the DIN rail.
   a) Hook the MP2200 into the top side of the DIN rail.
   b) Push the MP2200 towards the mounting base to secure it in place.



3. Lock the mounting clips.
   Push the DIN rail mounting clips to lock them in place.



4. Fix the MP2200 in place.
   Place end plates on either side of the MP2200 to secure it to the DIN rail.



This completes the installation procedure.

5.1.2 Replacing and Adding Optional Modules

Use the following procedures to replace or add Optional Modules.

(1) Preparations

1. Create a backup data file.

   Use the MPE720 to save the MP2200 program on a computer.

2. Remove the MP2200.

   Turn OFF the power supply and disconnect all cables from the MP2200. Then remove the MP2200 from the panel or rack and place it on a workbench or other area with sufficient space.

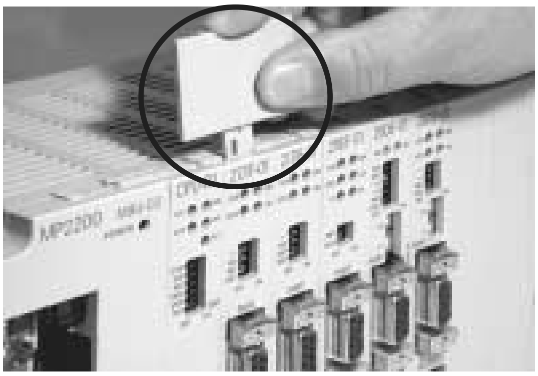
(2) Removing Optional Modules

1. Remove the battery cover.

   Pull the notch on the side of the MP2200 towards you to remove the battery cover.

2. Remove the Optional Module panel.

   Insert the protruding part of the battery cover into the slot on top of the panel of Optional Module to unhook it, as shown in the diagram. Face the front of the battery cover towards you for this operation.

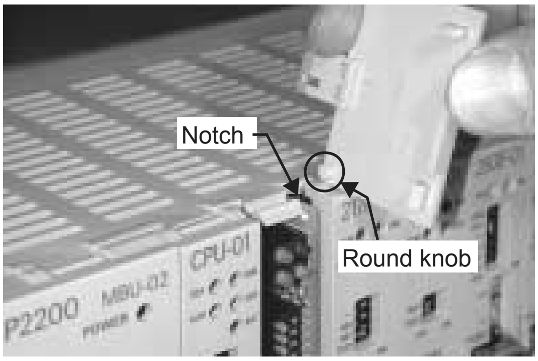


   Remove the cover on the bottom in the same way.

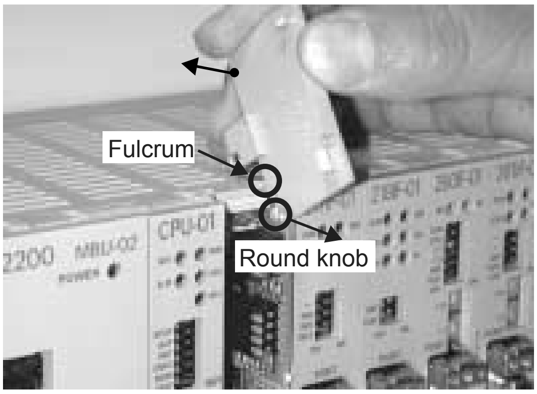
5

3. Remove the Optional Module from the mounting base.

   Pull the top of the panel of the Optional Module towards you to remove it. A notch on the Optional Module will be visible from the gap in the cover. Hook the round knob on the battery cover, shown in the diagram, into the notch in the Optional Module.



   Hold the center of the battery cover as shown in the following diagram. Push the battery cover down and out, rotating from the round knob to disconnect the Module and mounting base connectors, and then pull the Optional Module forward.



4. Pull out the Optional Module.

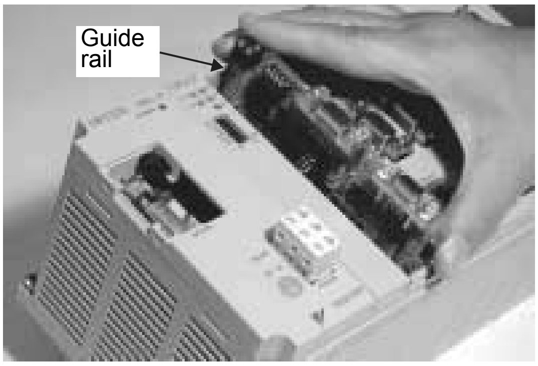
   Hold the Module on the top and bottom and pull it out straight. Hold the edges of the Module and avoid touching the components on the Module.

   Put the removed Module into the bag that it was supplied with and store it in this bag.

(3) Installing Optional Modules

1. Insert the Optional Module.

   Hold the top and bottom of the Module to be installed.



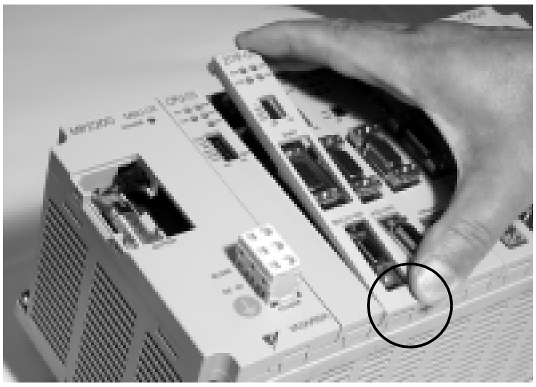
   Guide rails are visible at the top and bottom of the Option Slot, as shown in the above diagram. Line up the Module with the guide rail and insert the Module straight. The FG bar on the inside bottom of the Unit Case may be damaged if the Module is not inserted straight.

2. Mount on to the mounting base.

   Once the Optional Module has been completely inserted, place your hand on the front face of the Optional Module and push hard until the Optional Module has been inserted into the mounting base connectors. The front face of the Optional Module and the hook will be aligned when the Optional Module has been installed properly.

3. Install the Optional Module panel.

   Place the hole on the bottom of the panel of the Optional Module onto the hook on the bottom of the MP2200.



   Next, hook the hole at the top of the panel of the Optional Module onto the hook at the top of the MP2200.

5.2 Module Connections

5.2.1 Connecting Power Supply

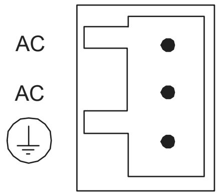
This section explains the connections for the MBU-01 and MBU-02 Units.

(1) MBU-01 Unit Connections

(a) Connectors

Supply a 100/200-VAC power supply to the MP2200.

The following diagram shows MBU-01 Unit connectors.

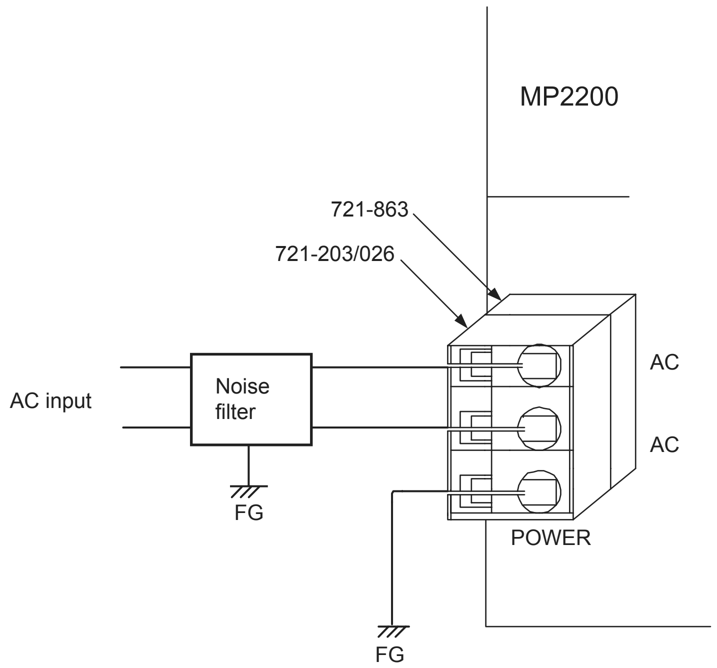


Symbol	Signal Name	Description
AC	AC	AC input
AC	AC	AC input
⏚	FG	Frame ground Ground to 100 Ω max.

(b) Connector Specifications

Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
Power Supply Connector	POWER	3	721-863/001-000	721-203/026-000	WAGO

(c) Connection Diagram



Note: Use a noise filter on the AC power supply line to the MBU-01.

Recommended noise filter:

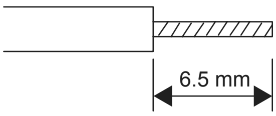
Manufacturer	Model
TDK	ZHG2210-11S

(d) Connection Procedure for 100/200-VAC Power Supply Cable

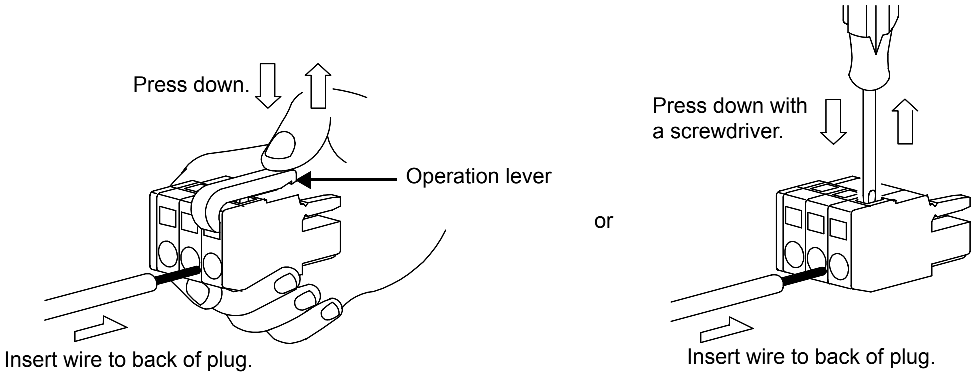
The power supply terminals have a removable connector. Use the following procedure to wire the terminals to the power supply connector. Use a 1.5 mm^2 to 2.5 mm^2 (AWG16 to AWG13) twisted-pair cable.

Use the following connection procedure.

1. Strip approximately 6.5 mm from the end of the wire.



2. First, insert an operation lever or flat-blade screwdriver into the opening and press it down as shown by the arrows in the following diagrams to open the clamp in the plug. Insert the wire into the opening and then close the opening by releasing the lever or removing the screwdriver.



Note: Method not using the operation lever.

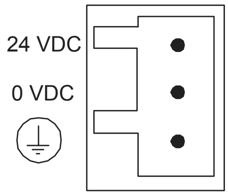
INFO Always separate the primary and secondary wiring when using a noise filter.

(2) MBU-02 Unit Connections

(a) Connectors

Supply a 24-VDC to the MP2200.

The following diagram shows MBU-02 Unit connectors.

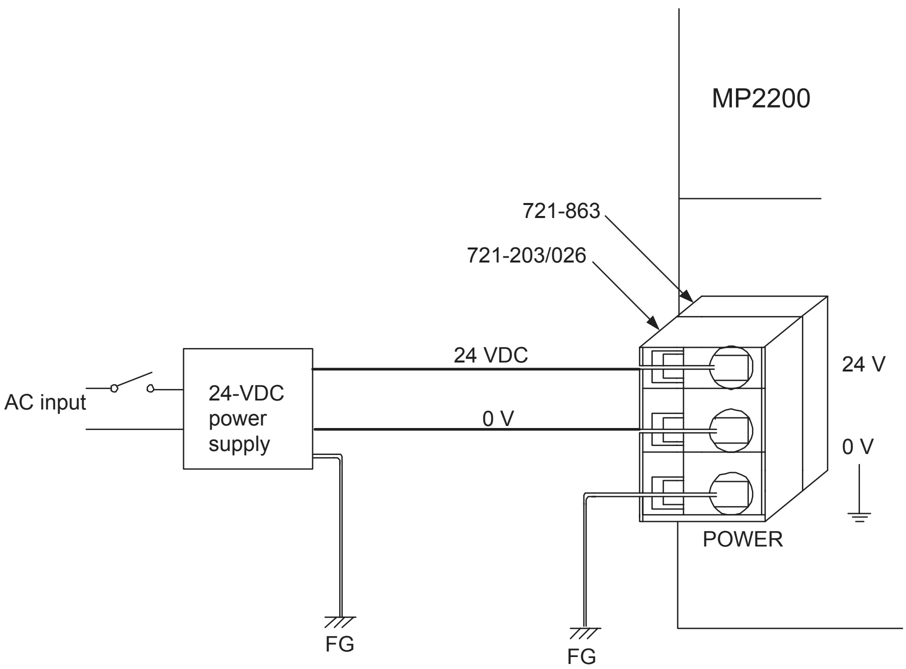


Symbol	Signal Name	Description
24 VDC	24V	24 VDC input
0 VDC	0V	0 V input
⏚	FG	Frame ground Ground to 100 Ω max.

(b) Connector Specifications

Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
Power Supply Connector	POWER	3	721-863/001-034	721-203/026-304	WAGO

(c) Connection Diagram



Note: Use an insulated 24-VDC power supply. Attach the power supply switch on the AC side. If the switch is attached on the 24-VDC side, there will be an inrush current of approximately 40 A when the power is turned ON.

(d) Connection Procedure for 24-VDC Power Supply Cable

The power supply terminals have a removable connector. Use the following procedure to wire the terminals to the power supply connector. Use a 0.2 mm^2 to 0.51 mm^2 (AWG24 to AWG20) twisted-pair cable.

Refer to *(d) Connection Procedure for 100/200-VAC Power Supply Cable* in *(1) MBU-01 Unit Connections* for the cable connection procedure.

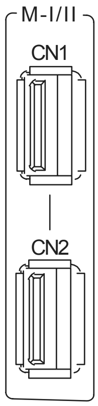
5.2.2 SVB-01 Module Connections

This section explains the connections for the SVB-01 Module.

(1) Connectors

MECHATROLINK-I/MECHATROLINK-II connectors are used to connect the SVB-01 Module and the SERVOPACKs and distributed I/O.

MECHATROLINK-I/MECHATROLINK-II connectors are shown in the following diagram.



Pin No.	Signal Name	Description
1	(NC)	Not used
2	/DATA	Signal -
3	DATA	Signal +
4	SH	Not used
Shell	Shield	Connects the shield wire.

INFO

- There are two connectors on the MECHATROLINK-I/MECHATROLINK-II, but the communication line supports only one channel.
- If the SVB-01 Module is connected at the end of a network, connect a JEPMC-W6022 Terminator to the other connector.
- Both connectors perform the same function, so connections can be made to either.

(2) Connector Specifications

Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
MECHATROLINK connector	M-I / II	4	USB-AR41-T11	DUSB-APA41B1-C50	DDK Ltd.

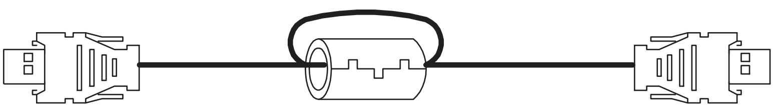
(3) Cables

Name and Specification	Model	Length
MECHATROLINK Cable USB Connector - USB Connector	JEPMC-W6002-A5	0.5 m
	JEPMC-W6002-01	1 m
	JEPMC-W6002-03	3 m
	JEPMC-W6002-05	5 m
	JEPMC-W6002-10	10 m
	JEPMC-W6002-20	20 m
	JEPMC-W6002-30	30 m
	JEPMC-W6002-40	40 m
	JEPMC-W6002-50	50 m
MECHATROLINK Cable USB Connector - USB Connector (with ferrite core)	JEPMC-W6003-A5	0.5 m
	JEPMC-W6003-01	1 m
	JEPMC-W6003-03	3 m
	JEPMC-W6003-05	5 m
	JEPMC-W6003-10	10 m
	JEPMC-W6003-20	20 m
	JEPMC-W6003-30	30 m
	JEPMC-W6003-40	40 m
	JEPMC-W6003-50	50 m
MECHATROLINK Cable USB Connector - Loose Wire	JEPMC-W6011-A5	0.5 m
	JEPMC-W6011-01	1 m
	JEPMC-W6011-03	3 m
	JEPMC-W6011-05	5 m
	JEPMC-W6011-10	10 m
	JEPMC-W6011-20	20 m
	JEPMC-W6011-30	30 m
	JEPMC-W6011-40	40 m
	JEPMC-W6011-50	50 m
Terminator	JEPMC-W6022	–

(4) External Appearance of MECHATROLINK-I/II Cables

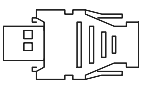
JEPMC-W6002-□□

JEPMC-W6003-□□



JEPMC-W6010-□□

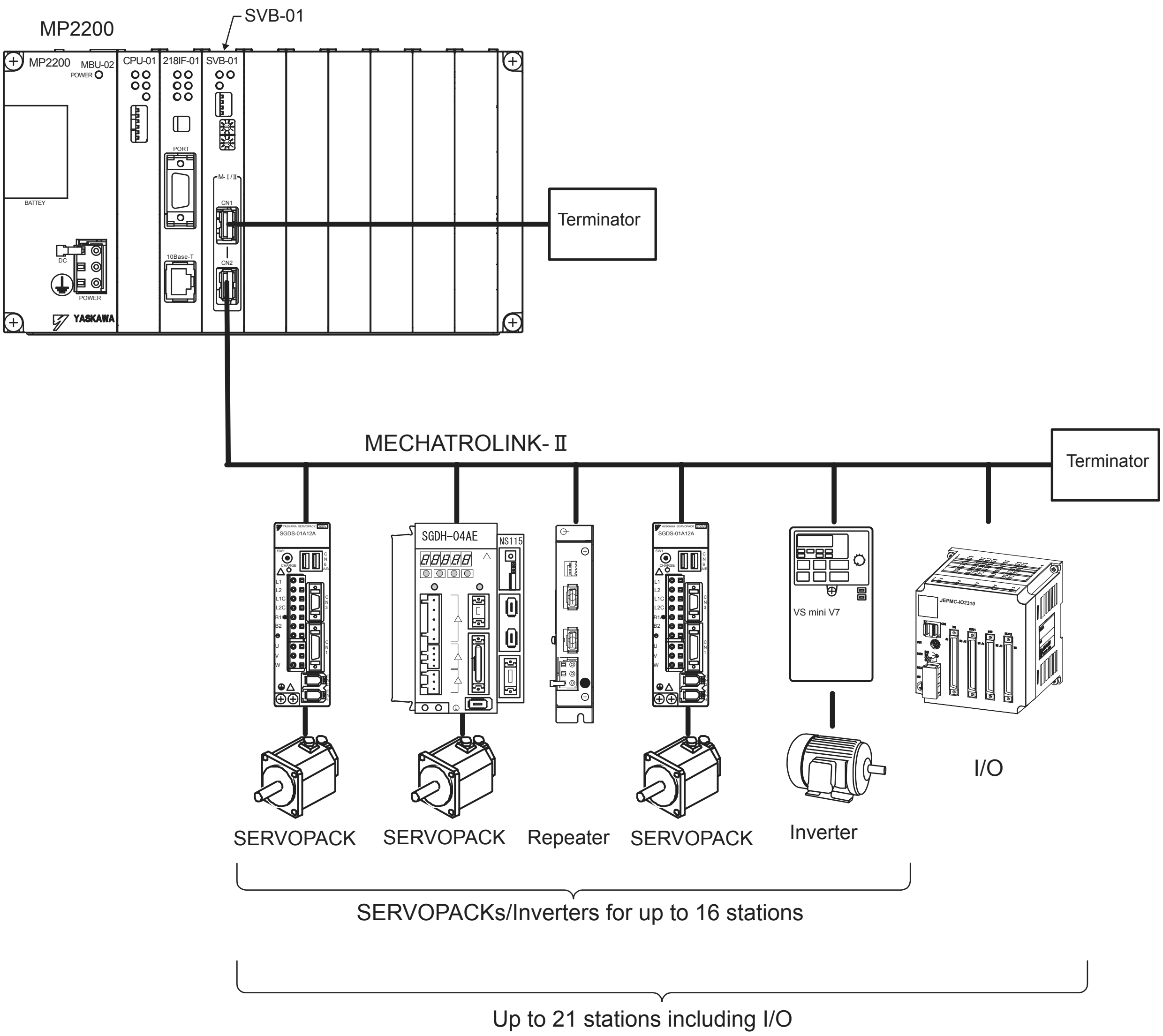
JEPMC-W6022



(5) SVB-01 Module System Configuration

(a) Connecting the SVB-01 Module to the End of the MECHATROLINK Network

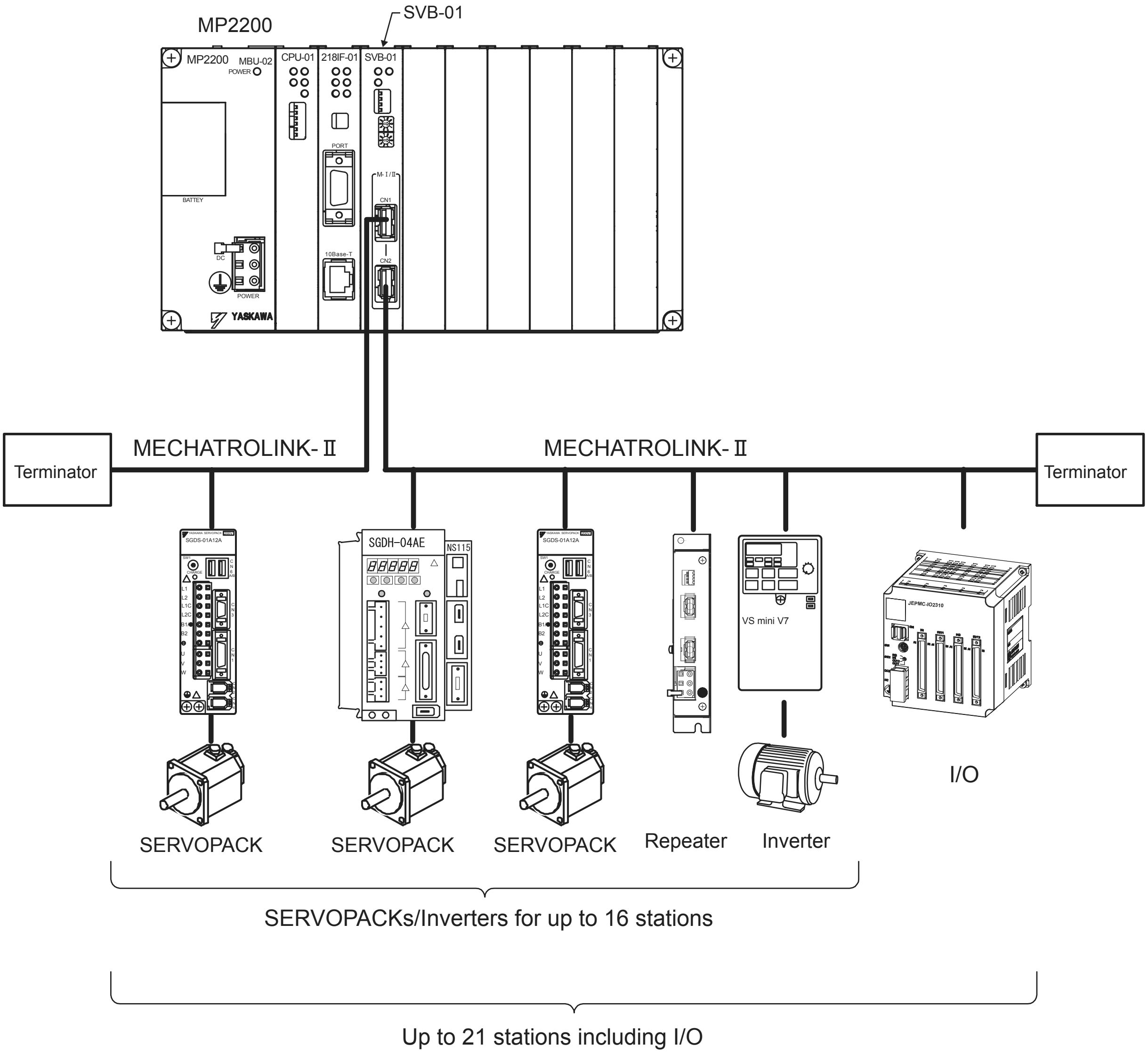
The following diagram shows a system configuration example.



Note: Insert a JEPMC-W6022 Terminator into the unused MECHATROLINK port.

(b) Connecting the SVB-01 Module in the Middle of the MECHATROLINK Network

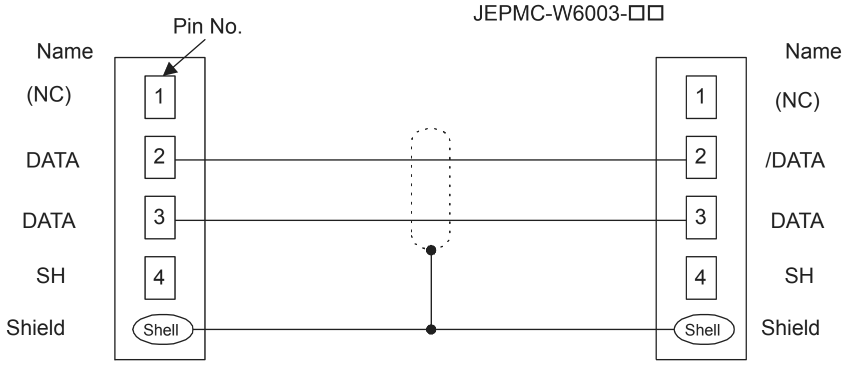
The following diagram shows a system configuration example.



Note: Insert a JEPMC-W6022 Terminator into the unused MECHATROLINK port.

(6) Connections between Devices

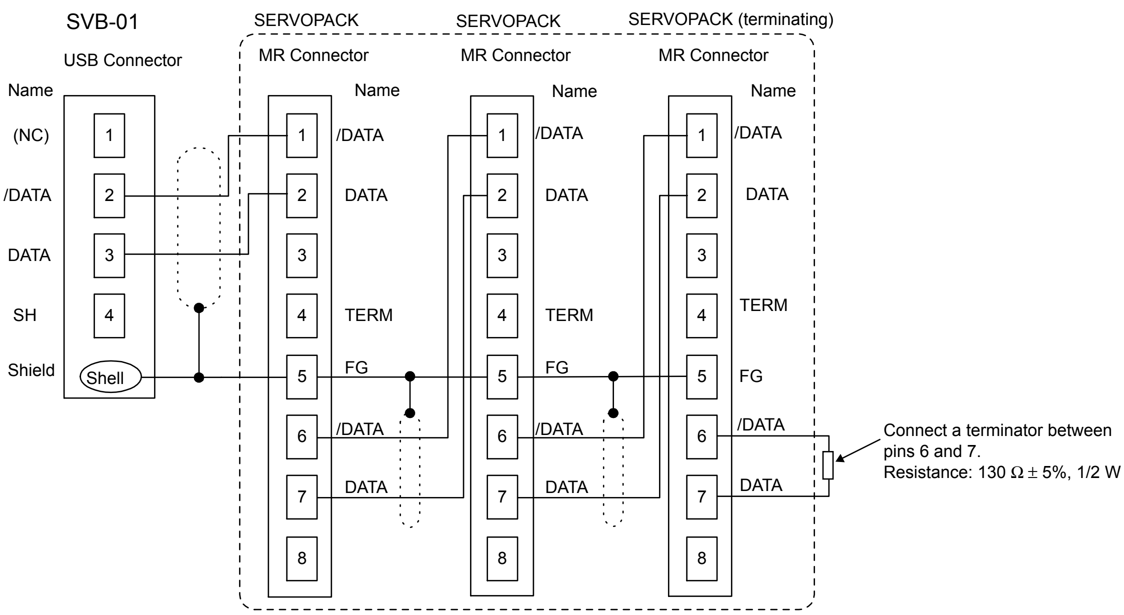
(a) Cable Connections between the SVB-01 and I/O Units and the MP2200 and SERVOPACKs



Note: The JEPMC-W6003-□□ Cable has a ferrite core.

(b) Cable Connections between the SVB-01 and SGD-□□□N and SGDB-□□AN SERVOPACKs

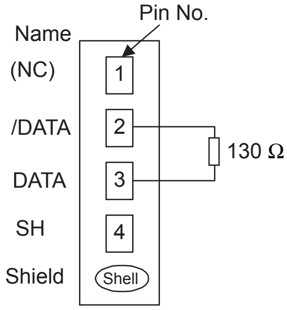
Cable model number: JEPMC-W6011-□□



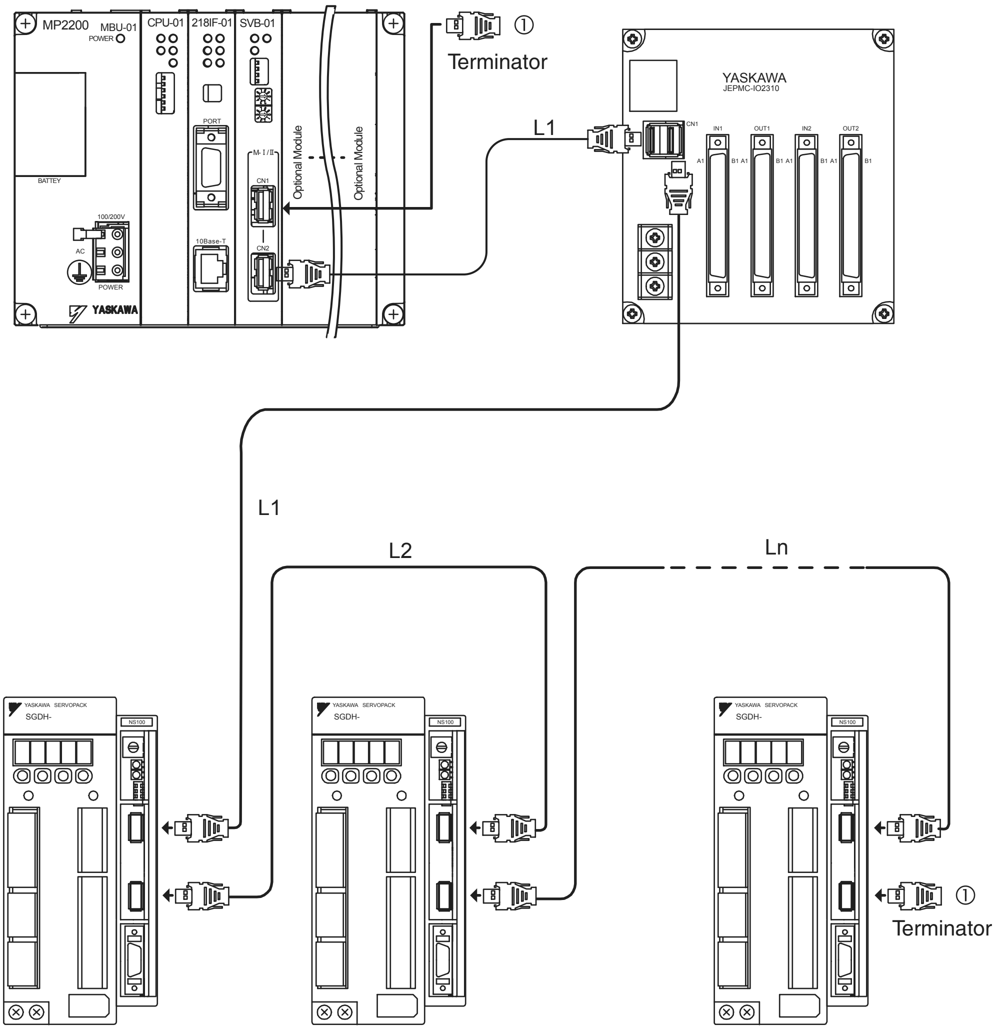
Note: 1. The JEPMC-6010- has a USB connector on one end and loose wires on the other end. Use an MR connector and wiring material to create a 1:N cable.
2. The terminating resistance for SGD-□□□N ,SGDB-□□□AN must be provided by the user.
3. Prepare the cables according to following MECHATROLINK-I specifications. Connections that do not meet the specifications will prevent normal communication due to the influence of reflected waves or other factors.
Total network length: 50 m max.
Maximum number of slave stations: 14 stations max.
Minimum distance between stations: 0.3 m min.

(c) Terminator Connections

Terminator model number: JEPMC-W6022



(d) Connection Example between the SVB-01, SERVOPACKs, and the IO2310



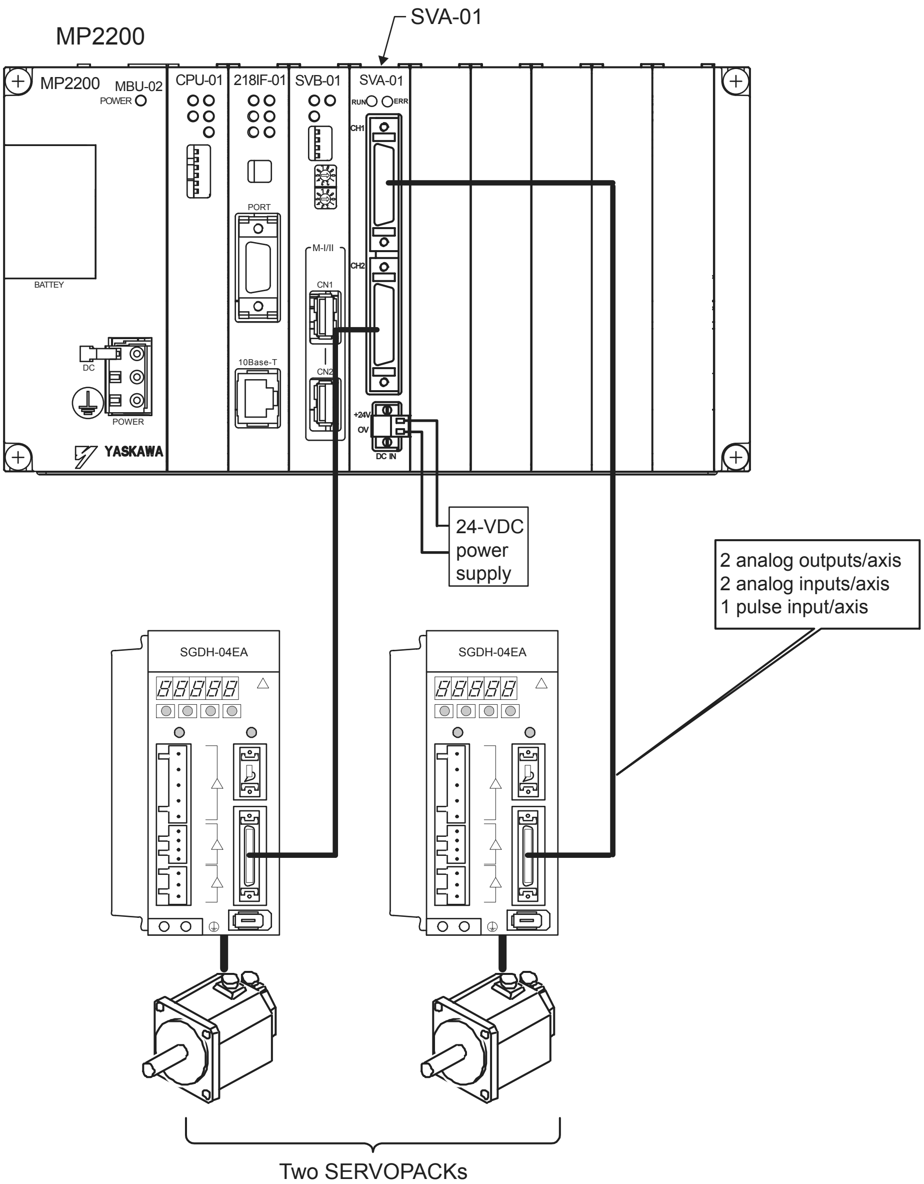
Note: 1. Use standard cables between Units.
2. The total connection length (L1 + L2 + L3 +.... + Lu) must be no longer than 50 m.

IMPORTANT	The MP2200 has a built-in terminator. Insert a JEPMC-W6022 Terminator into (1) in the above diagram.

5.2.3 SVA-01 Module Connections

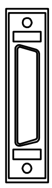
This section explains the connections for the SVA-01 Module.

(1) System Connection Example



(2) Connector and Cable Specifications

(a) Servo Interface Connectors (CN1 and CN2)



These connectors connect the SVA-01 Module to two SERVOPACKs.
They are connected using the following standard cable.

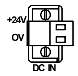
- JEPMC-W2040-□□ (For SGDH, SGDM, and SGDS SERVOPACKs)

Note: The customer must provide cables for the SGDA and SGDB SERVOPACKs.

(b) 24-V Input Connector (CN3)

This connector connect the SVA-01 Module to +24 VDC as a Servo I/O power supply.

A screw terminal connector is used (BL3.5/2F-AU manufactured by Weidmuller)



Pin No.	Signal Name	Name
2	24V	+24 VDC input
1	0V	0 V

(c) Servo Connector Specifications

The following table shows the connector specifications.

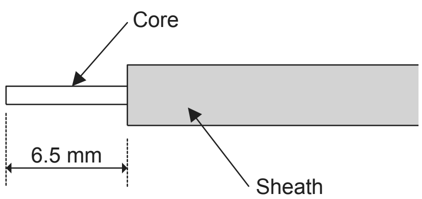
Name	Connector Name	No. of Pins	Connector Model			Cable Model Numbers
			Module side	Cable side	Manufacturer	
Servo interface connector 1 and connector 2	CN1 CN2	36	10236-52A2JL	• Connector body: 10136-3000VE • Shell: 10336-52A0-008 ÅiScrew lockingÅj 10336-52F0-008 ÅiOne-touch lockingÅj	3M	JEPMC-W2040-□□ (For the SGDH/ SGDM/SGDS)
24-V input connector	CN3	2		• BL3.5/2F-AU	Weidmuller	The CN3 connector is included with the SVA-01 Module, but a cable is not included. The user must connect the cable.

(d) Connection Procedure for 24-V Input Cable

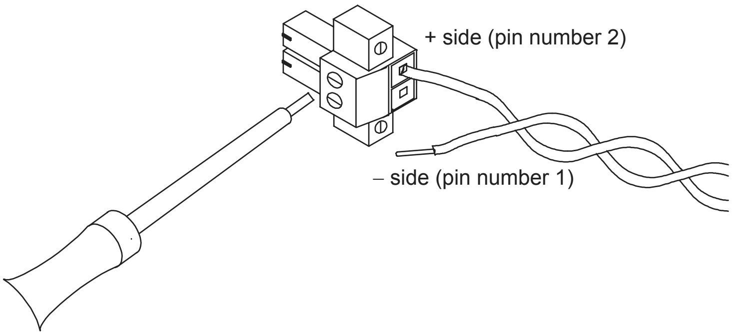
Use a 0.2 mm^2 to 0.51 mm^2 (AWG24 to AWG20) twisted-pair cable.

Use the following connection procedure.

1. Strip the wire for approximately 6.5 mm.
   Strip approximately 6.5 mm from the end of the wire.



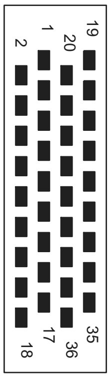
2. Tighten the wires with the screws.
   Insert the wire into the opening and then tighten the screws to a tightening torque of approximately 0.3 to 04 N·m.



Pin No.	Signal Name	Name
2	24V	+24 VDC input
1	0V	0 V

(e) Connector Pin Arrangement (CN1 and CN2)

The following figure shows the 36-pin arrangement of CN1 and CN2.



Arrangement from Connector
Wiring Side on Cable Side

The following figure shows the pin names and assignments for connectors CN1 and CN2.

Pin	Signal	Description
1	SG	Ground (analog)
2	AO_0 (NREF)	General-purpose analog output 0 (speed reference output)
3	PA	5-V differential phase A pulse input (+)
4	PAL	5-V differential phase A pulse input (–)
5	PC	5-V differential phase C pulse input (+)
6	PCL	5-V differential phase C pulse input (–)
7	SG	Ground
8	AI_0	General-purpose analog input 0 (Feedback speed monitor input)
9	AO_1 (TREF)	General-purpose analog output 1 (torque reference output)
10	0V (For 24 V)	0 V (for 24 V) output
11	0V (For 24 V)	0 V (for 24 V) output
12	DO_2 (PCON)	General-purpose output DO_2 ★ (P action reference output)
13	DO_4	General-purpose output DO_4
14	DO_3	General-purpose output DO_3
15	DI_3 (P-OT)	General-purpose input DI_3 (positive overtravel input)
16	+24V	+24 V output
17	DI_0 (SVALM)	General-purpose input DI_0 ★ (Servo alarm input)
18	DI_2 (ZERO/HOME LS) ◥	General-purpose input DI_2 (ZERO/HOME LS input)
19	SG	Ground (For SEN signal)
20	SEN (5V)	SEN Signal (Servo)
21	AI_1	General-purpose analog input 1 (Torque reference monitor input)
22	–	Not connected
23	PB	5-V differential phase B pulse input (–)
24	PBL	5-V differential phase B pulse input (–)
25	SG	Ground
26	AI-GND	Analog input ground
27	AO-GND	Analog output ground
28	0V (For 24 V)	0 V (for 24 V) output
29	0V (For 24 V)	0 V (for 24 V) output
30	DO_1 (ALMRST)	General-purpose output DO_1 ★ (Alarm reset ouput)
31	DO_0 (SV ON)	General-purpose output DO_0 ★ (Servo ON output)
32	DO_5 (SEN)	General-purpose output DO_5 ★ (VS866 24-V SEN signal)
33	DI_4 (N-OT)	General-purpose input DI_4 (Negative overtravel input)
34	+24V	+24 output
35	DI_1 (SRDY)	General-purpose input DI_1 ★ (Servo delay input)
36	DI_5 (EXT/DEC) ◥	General-purpose input DI_5 (EXT/DEC signal input)

Note 1. ◥: Inputs signals with a latch function.
2. ★: Signals that can be used as general-purpose I/O signals only in general-purpose I/O mode.
In normal operation mode, the SVA-01 uses these as system I/O.

INFO Either 5 V or 24 V can be selected for the SEN signal. Connect pin 20 or pin 32 according to the application. Pin 20 (5 V) is connected in the standard cable.

(f) Cables

The following standard cables are available for use with the SVA-01 Module. These cables are used to connect the SVA-01 Module to SERVOPACKs, overtravel limit switches, and other machine connections.

Table 5.1 Cables

Applicable SERVOPACKs	Model	Length
SGDA-□□□S, SGDB-□□	No standard cable is available.	–
SGDM, SGDH, SGDS-□□□01□, SGDS-□□□02□	JEPMC-W2040-A5	0.5 m
	JEPMC-W2040-01	1.0 m
	JEPMC-W2040-03	3.0 m

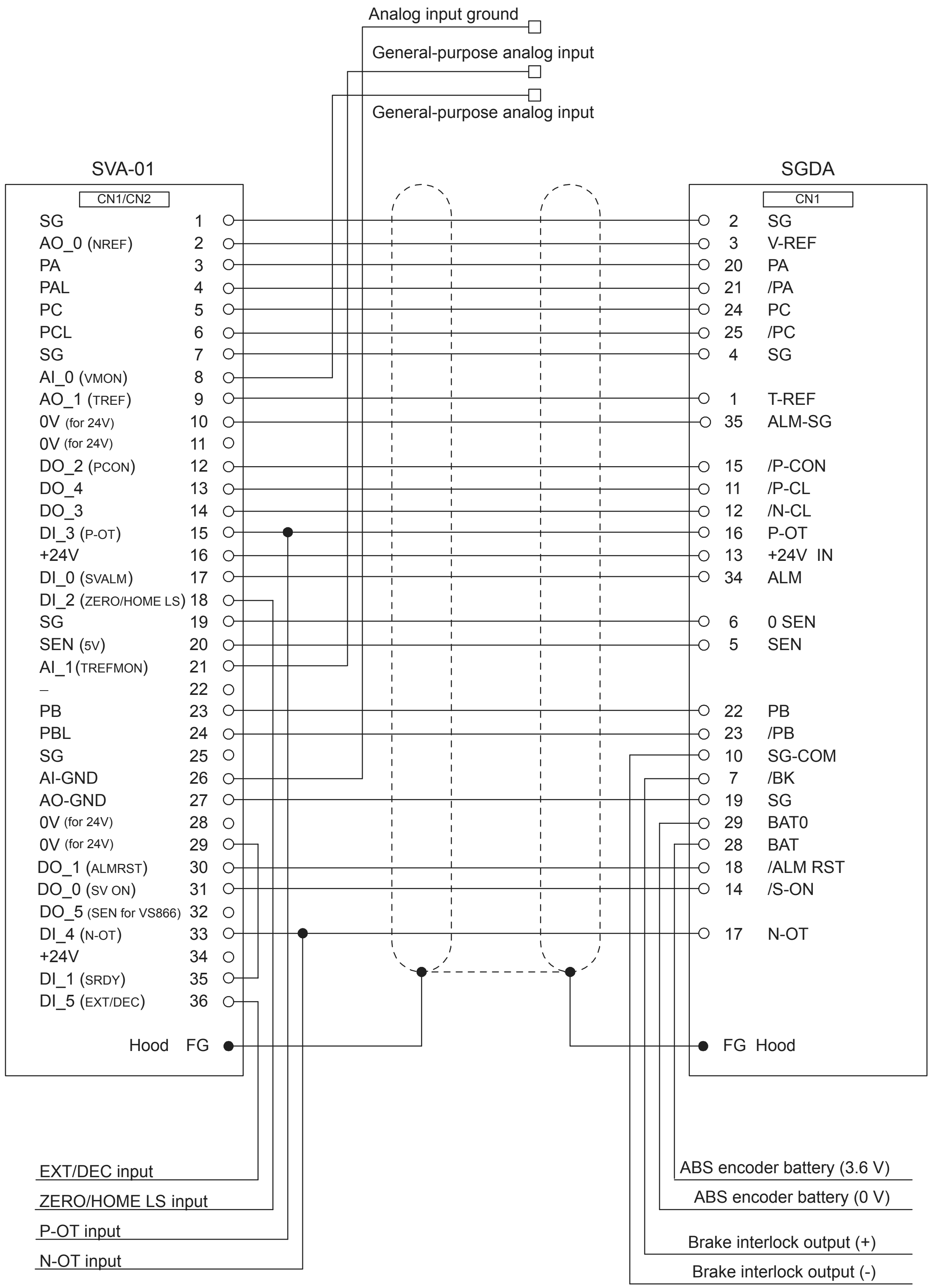
Refer to the following pages for details on these cables.

(g) SERVOPACK Connection Cables for SGDA-□□□S

• Model

No standard cable is available. Prepare a cable referring to the following cable connections diagram.

• Cable Connections Diagram

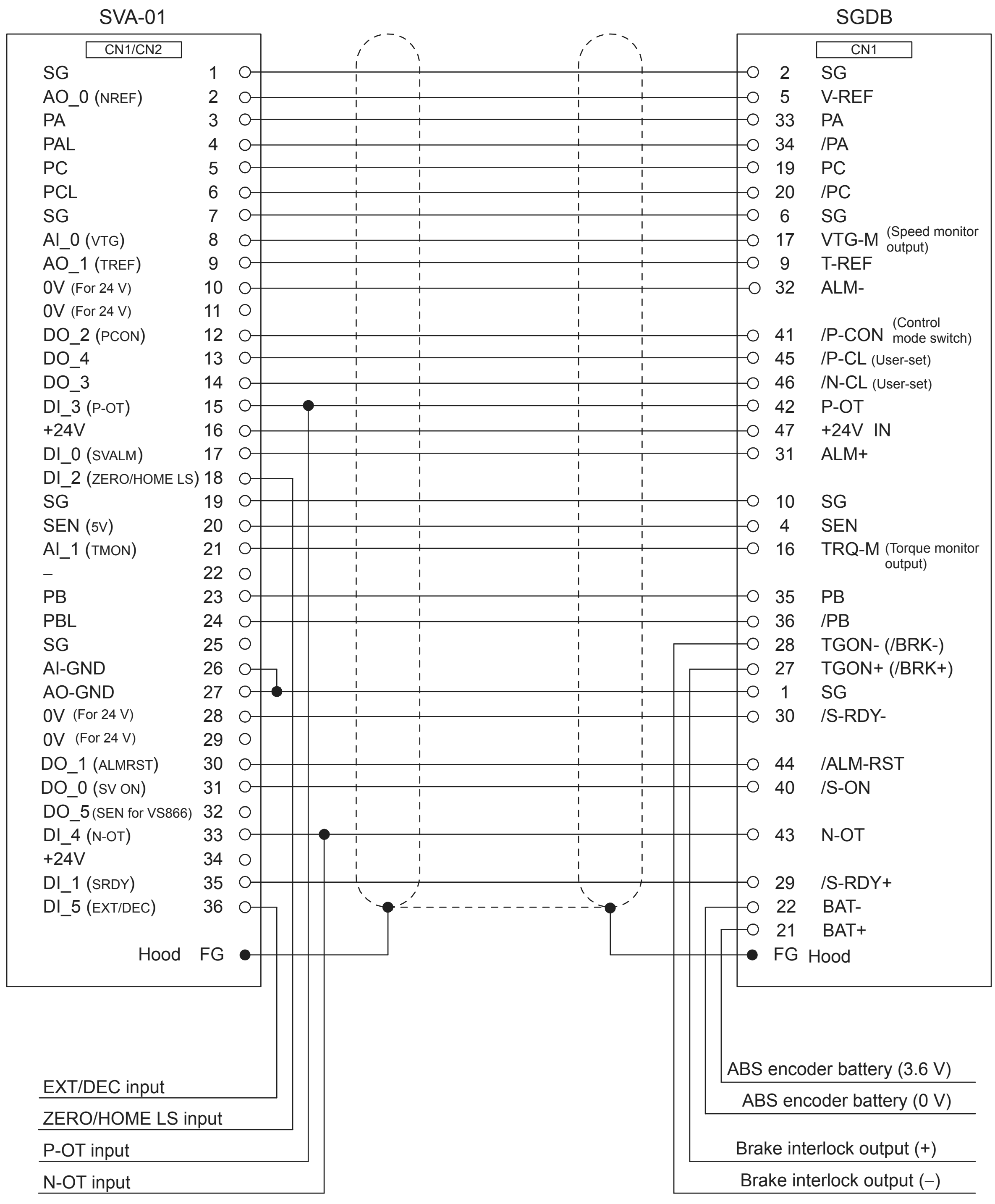


(h) SERVOPACK Connection Cables for SGDB-☐☐

• **Model**

No standard cable is available.

• **Cable Connections Diagram**

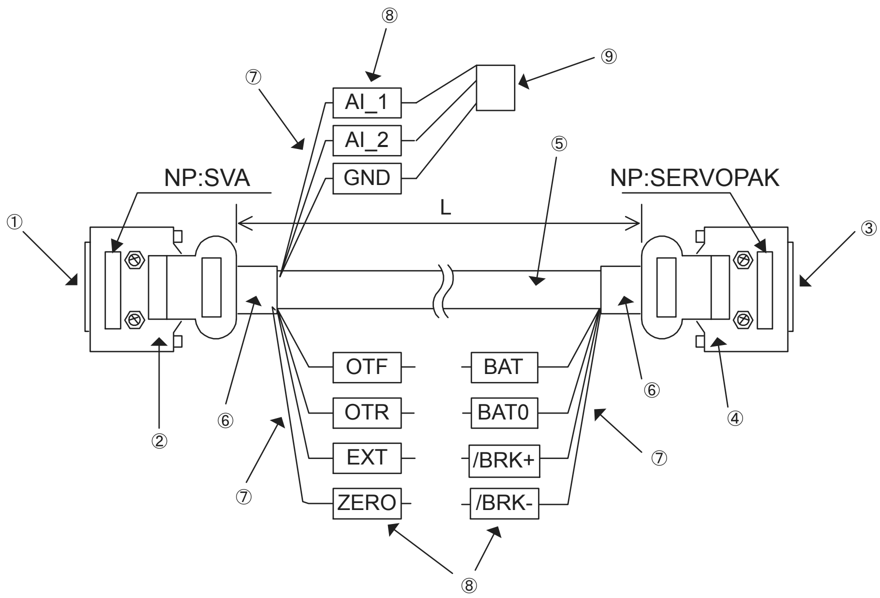


(i) SERVOPACK Connection Cables for SGDM/SGDH/SGDS-□□□01□/□□□02□

- Model

JEPMC-W2040-A5: 0.5 m
JEPMC-W2040-01: 1.0 m
JEPMC-W2040-03: 3.0 m

- Appearance

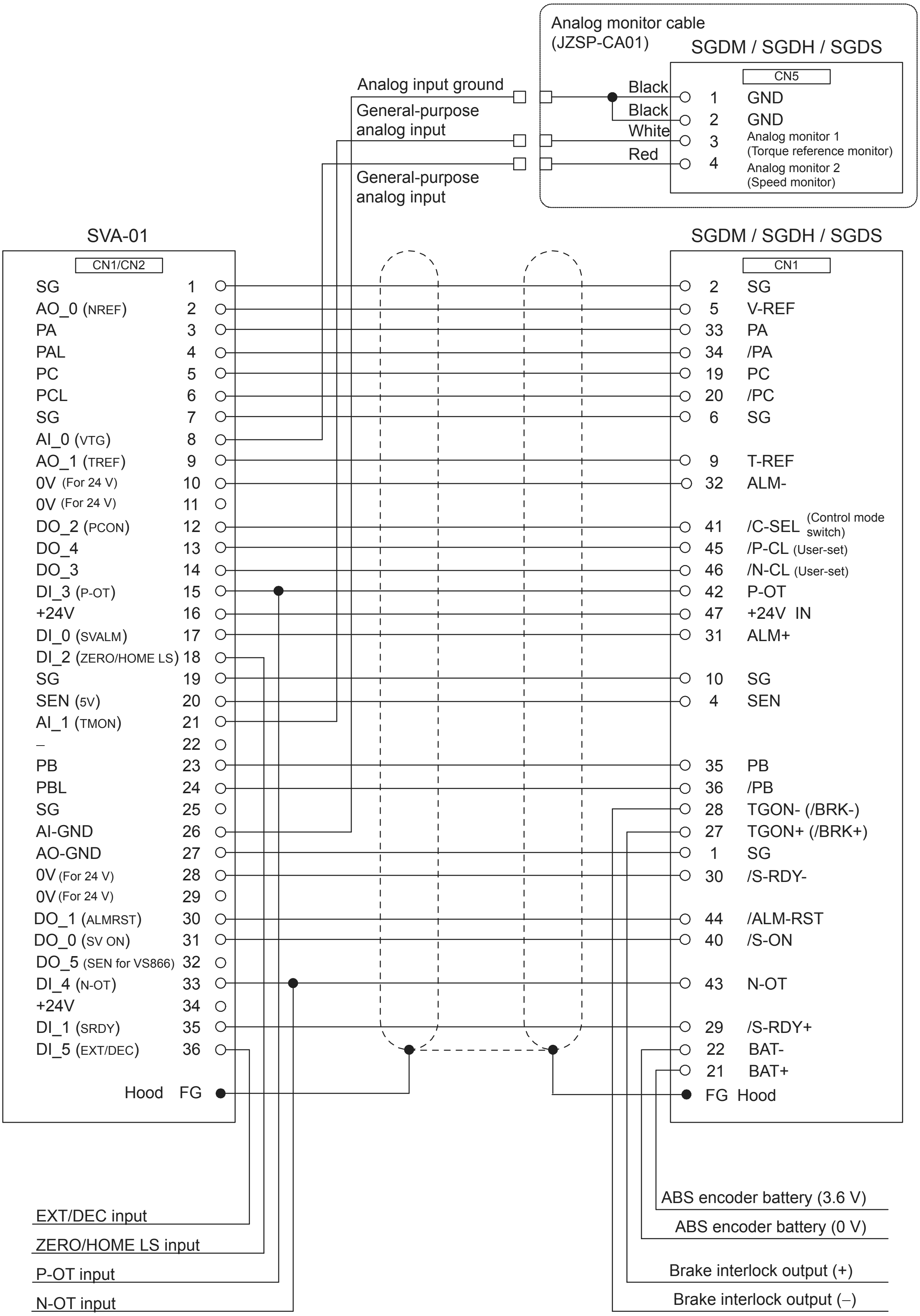


- Cable Specifications

Diagram No.	Name	Model	Qty	Manufacturer	Remarks
①	Plug on SVA end	10136-3000VE	1	Sumitomo 3M	Soldered
②	Shell on SVA end	10336-52A0-008	1	Sumitomo 3M	
③	Plug on Servo end	10150-3000VE	1	Sumitomo 3M	Soldered
④	Shell on Servo end	10350-52Z0-008	1	Sumitomo 3M	
⑤	Cable	HP-SB/20276SR 26 x AWG28	–	Taiyo Cable	Shield wire
⑥	Heat-shrinking tube	F2 (Z)	–	Sumitomo Electric Industries. Ltd.	Or equivalent
⑦	Wires	UL1061 AWG28	–	–	OTF: Brown OTR: Orange EXT: Black ZERO: BAT: Blue BAT0: Purple *BRK+: Gray *BRK-: White AI_1: White AI_2: Red GND: Black
⑧	Marking tubes	2-mm dia., white	11	–	Printing color: Black
⑨	Socket	DF11-4DS-2C	1	Hirose Electric Co., Ltd.	
	Contacts	DF11-2428SCF	1	Hirose Electric Co., Ltd.	

5

• Cable Connections Diagram



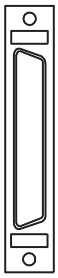
5.2.4 LIO Module Connections

This section explains the connections for the LIO-01 and LIO-02 Modules.

(1) LIO-01 Module Connections

(a) Connectors

The following diagram shows the LIO-01 Module connector.



Connects external I/O signals and pulse input signals.
External input: 16 points
External output: 16 points
Pulse input: 1 channel

(b) Connector Specifications

The following table shows the connector specifications.

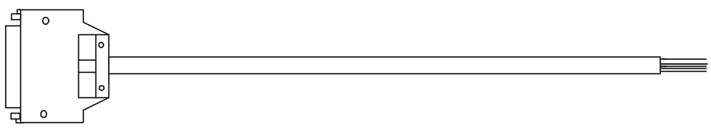
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
I/O Connector	I/O	48	FCN-365P048-AU	FCN-360C048-E (cover) FCN-364J048-AU	Fujitsu component

(c) Cables

Name	Model	Length
Cable for LIO Modules	JEPMC-W2061-A5	0.5 m
	JEPMC-W2061-01	1 m
	JEPMC-W2061-03	3 m

(d) External Appearance of Cables for LIO Module

JEPMC-W2061-□□



(e) Connector Pin Arrangement

The following table shows the connector pin arrangement of the LIO-01 Module.

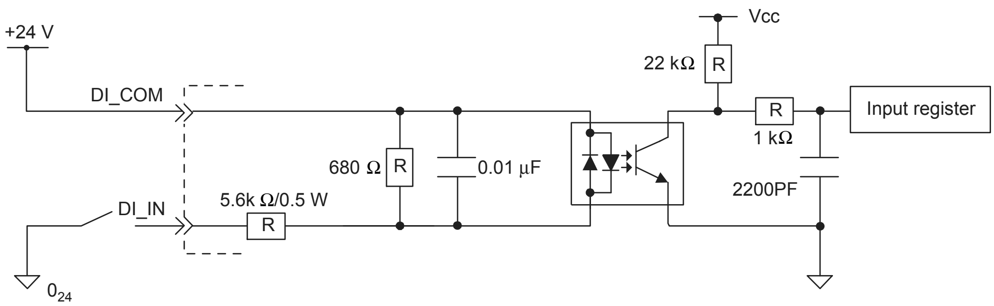
Pin Num-ber	Signal Name	I/O	Remarks	Pin Num-ber	Signal Name	I/O	Remarks
A1	PA	I	Phase-A pulse (+)	B1	PAL	I	Phase-A pulse (–)
A2	PB	I	Phase-B pulse (+)	B2	PBL	I	Phase-B pulse (–)
A3	PC	I	Phase-Z pulse (+)	B3	PCL5	I	Phase-Z pulse (–5 V input)
A4	GND	I	Pulse input ground	B4	PCL12	I	Phase-Z pulse (–12 V input)
A5	DO_COM	P	Output common	B5	DO_COM	P	Output common
A6	DO_24V	P	24 V input	B6	DO_24V	P	24 V input
A7	DO_15	O	Output 15	B7	DO_14	O	Output 14
A8	DO_13	O	Output 13	B8	DO_12	O	Output 12
A9	DO_11	O	Output 11	B9	DO_10	O	Output 10
A10	DO_09	O	Output 9	B10	DO_08	O	Output 8
A11	DO_07	O	Output 7	B11	DO_06	O	Output 6
A12	DO_05	O	Output 5	B12	DO_04	O	Output 4
A13	DO_03	O	Output 3	B13	DO_02	O	Output 2
A14	DO_01	O	Output 1	B14	DO_00	O	Output 0
A15	DI_15	I	Input 15	B15	DI_14	I	Input 14
A16	DI_13	I	Input 13	B16	DI_12	I	Input 12
A17	DI_11	I	Input 11	B17	DI_10	I	Input 10
A18	DI_09	I	Input 9	B18	DI_08	I	Input 8
A19	DI_07	I	Input 7	B19	DI_06	I	Input 6
A20	DI_05	I	Input 5	B20	DI_04	I	Input 4
A21	DI_03	I	Input 3	B21	DI_02	I	Input 2
A22	DI_01	I	Input 1	B22	DI_00	I	Input 0
A23	DI_COM0	P	Input common 0	B23	DI_COM1	P	Input common 1
A24	FG	–	Frame ground	B24	FG	–	Frame ground

Note: P: Power input; I: Input signal; O: Open-collector output

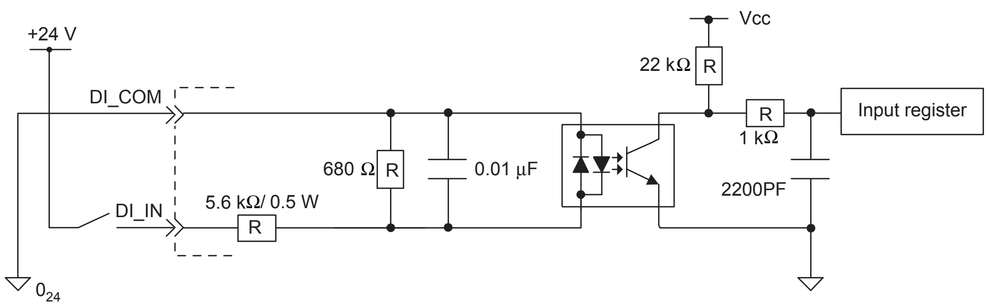
(f) Input Circuit

The following table shows the LIO-01 Module input circuit specifications.

Item	Specifications
Inputs	16 points
Input Format	Sink mode/source mode inputs
Isolation Method	Photocoupler
Input Voltage	±24 VDC ±20 %
Input Current	4.1 mA (typ.)
ON Voltage/Current	15 V min./ 2.0 mA min.
OFF Voltage/Current	5 V max./1.0 mA max.
ON Time/OFF Time	ON: 1 ms max., OFF: 1 ms max.
Number of Commons	8 (DI_COM0: DI_00 to DI_07, DI_COM1: DI_08 to DI_15)
Other Functions	• DI-00 (interrupt input) DI-00 is shared with interrupts. If DI-00 is turned ON while interrupts are enabled, the interrupt processing drawing is executed. • DI-01 (pulse latch input) DI-01 is shared with pulse latch inputs. If DI-01 is turned ON while pulse latch inputs are enabled, the pulse counter will be latched.



Digital Input Circuit (Sink Mode Input)

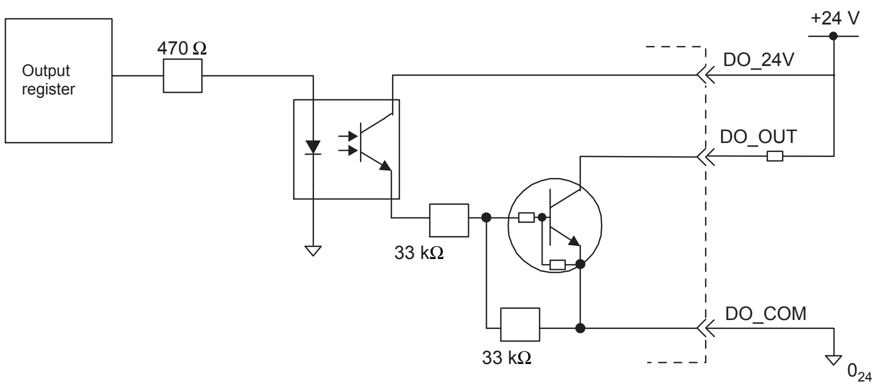


Digital Input Circuit (Source Mode Input)

(g) Output Circuit

The following table shows the LIO-01 Module output circuit specifications.

Item	Specifications
Outputs	16 points
Output Format	Transistor, open-collector, sink mode outputs
Isolation Method	Photocoupler
Output Voltage	24 VDC ± 20 %
Output Current	100 mA max.
Leakage Current when OFF	0.1 mA max.
ON Time/OFF Time	ON: 1 ms max., OFF: 1 ms max.
Number of Commons	16 points
Protection Circuit	Fuse The fuse is not, however, for circuit protection. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection is required.
Error Detection	Fuse blown detection
Other Functions	• DO-00 DO-00 is shared with counter position detection.

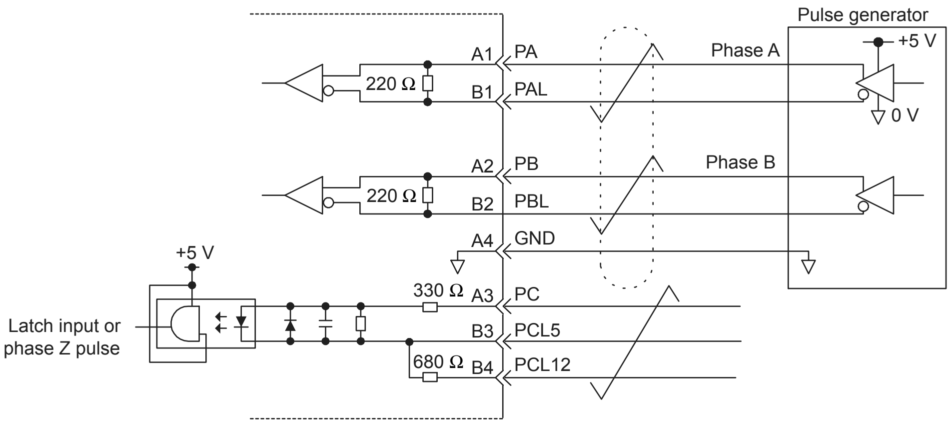


Digital Output Circuit (Sink Mode Output)

(h) Pulse Input Circuit

The following table shows the LIO-01 Module pulse input circuit specifications.

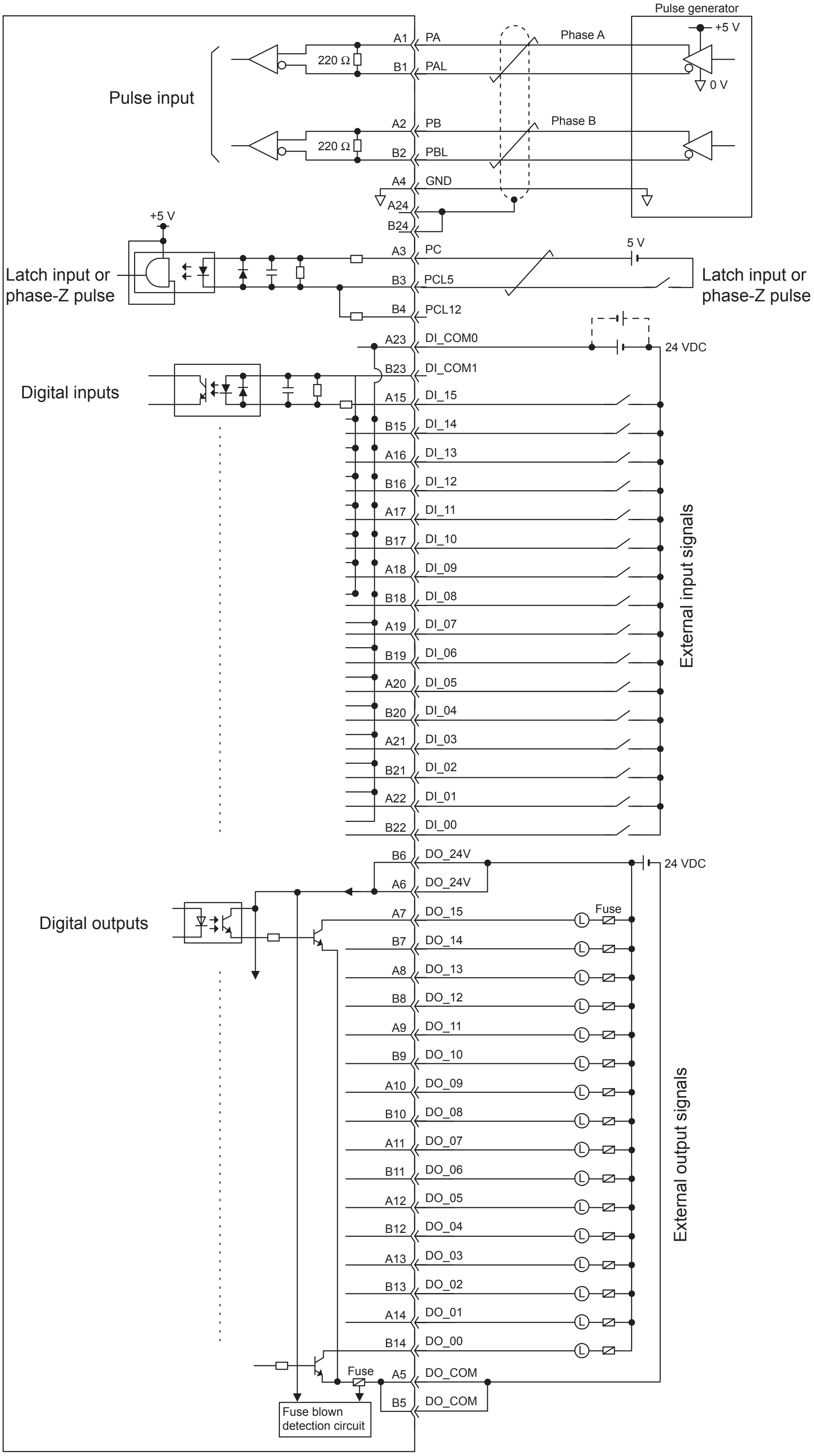
Item	Specifications
Number of Points	1 (Phase-A/B/Z input)
Input Circuit	Phase-A/B: 5-V differential input, not isolated, max. frequency: 4 MHz Phase-Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz
Input Mode	Phase-A/B, signed, incremental/decremental
Latch Input	Pulse latch on phase-Z or DI-01. Response time: 5 µs max. for phase-Z input; 60 µs max. for DI-01 input.
Other Functions	Coincidence detection, counter preset, and counter clear



Pulse Input Circuit

(i) Module Connections

The following diagram shows a connection example for LIO-01 Module connectors.

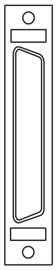


Note: Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.

(2) LIO-02 Module

(a) Connectors

The following diagram shows the LIO-02 Module connector.



Connects external I/O signals and pulse input signals.
External input: 16 points
External output: 16 points
Pulse input: 1 channel

(b) Connector Specifications

The following table shows the connector specifications.

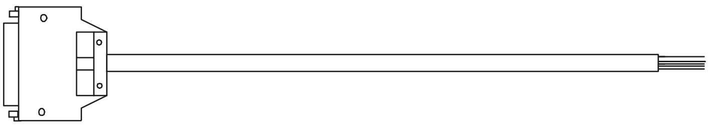
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
I/O Connector	I/O	48	FCN-365P048-AU	FCN-360C048-E (cover) FCN-364J048-AU	Fujitsu component

(c) Cables

Name	Model	Length
Cable for LIO Modules	JEPMC-W2061-A5	0.5 m
	JEPMC-W2061-01	1 m
	JEPMC-W2061-03	3 m

(d) External Appearance of Cables for LIO Module

JEPMC-W2061-□□



(e) Connector Pin Arrangement

The following table shows the connector pin arrangement for the LIO-02 Module.

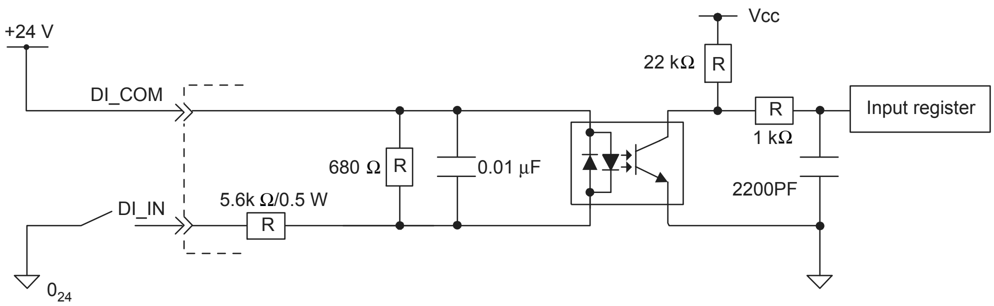
Pin Number	Signal Name	I/O	Remarks	Pin Number	Signal Name	I/O	Remarks
A1	PA	I	Phase-A pulse (+)	B1	PAL	I	Phase-A pulse (–)
A2	PB	I	Phase-B pulse (+)	B2	PBL	I	Phase-B pulse (–)
A3	PC	I	Phase-Z pulse (+)	B3	PCL5	I	Phase-Z pulse (–5 V input)
A4	GND	I	Pulse input ground	B4	PCL12	I	Phase-Z pulse (–12 V input)
A5	DO_COM	P	Output common	B5	DO_COM	P	Output common
A6	DO_24V	P	24 V input	B6	DO_24V	P	24 V input
A7	DO_15	O	Output 15	B7	DO_14	O	Output 14
A8	DO_13	O	Output 13	B8	DO_12	O	Output 12
A9	DO_11	O	Output 11	B9	DO_10	O	Output 10
A10	DO_09	O	Output 9	B10	DO_08	O	Output 8
A11	DO_07	O	Output 7	B11	DO_06	O	Output 6
A12	DO_05	O	Output 5	B12	DO_04	O	Output 4
A13	DO_03	O	Output 3	B13	DO_02	O	Output 2
A14	DO_01	O	Output 1	B14	DO_00	O	Output 0
A15	DI_15	I	Input 15	B15	DI_14	I	Input 14
A16	DI_13	I	Input 13	B16	DI_12	I	Input 12
A17	DI_11	I	Input 11	B17	DI_10	I	Input 10
A18	DI_09	I	Input 9	B18	DI_08	I	Input 8
A19	DI_07	I	Input 7	B19	DI_06	I	Input 6
A20	DI_05	I	Input 5	B20	DI_04	I	Input 4
A21	DI_03	I	Input 3	B21	DI_02	I	Input 2
A22	DI_01	I	Input 1	B22	DI_00	I	Input 0
A23	DI_COM0	P	Input common 0	B23	DI_COM1	P	Input common 1
A24	FG	–	Frame ground	B24	FG	–	Frame ground

Note: P: Power input; I: Input signal; O: Open-collector output

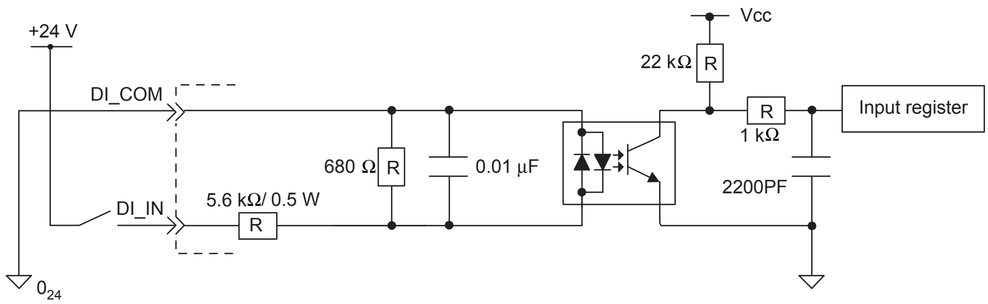
(f) Input Circuit

The following table shows the LIO-02 Module input circuit specifications.

Item	Specifications
Inputs	16 points
Input Format	Sink mode/source mode inputs
Isolation Method	Photocoupler
Input Voltage	±24 VDC ± 20 %
Input Current	4.1 mA (typ.)
ON Voltage/Current	15 V min./ 2.0 mA min.
OFF Voltage/Current	5 V max./1.0 mA max.
ON Time/OFF Time	ON: 1 ms max., OFF: 1 ms max.
Number of Commons	8 (DI_COM0: DI_00 to DI_07, DI_COM1: DI_08 to DI_15)
Other Functions	• DI-00 (interrupt input) DI-00 is shared with interrupts. If DI-00 is turned ON while interrupts are enabled, the interrupt processing drawing is executed. • DI-01 (pulse latch input) DI-01 is shared with pulse latch inputs. If DI-01 is turned ON while pulse latch inputs are enabled, the pulse counter will be latched.



Digital Input Circuit (Sink Mode Input)

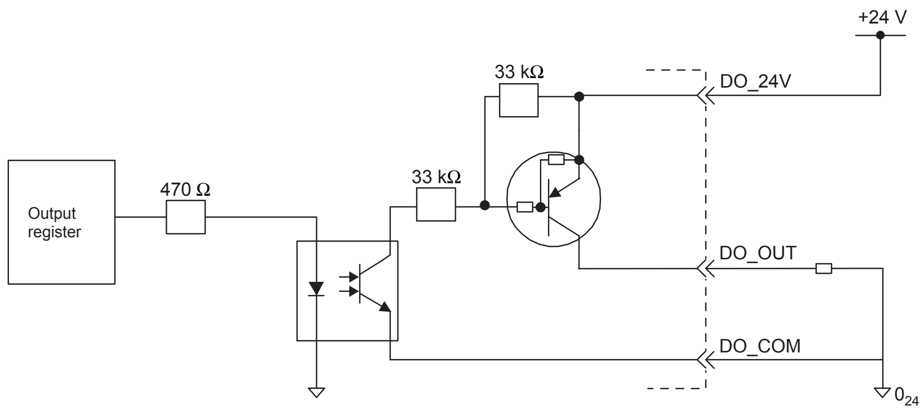


Digital Input Circuit (Source Mode Input)

(g) Output Circuit

The following table shows the LIO-02 Module output circuit specifications.

Item	Specifications
Outputs	16 points
Output Format	Transistor, open-collector, source mode outputs
Isolation Method	Photocoupler
Output Voltage	24 VDC ±20 %
Output Current	100 mA max.
Leakage Current when OFF	0.1 mA max.
ON Time/OFF Time	ON: 1 ms max., OFF: 1 ms max.
Number of Commons	16 points
Protection Circuit	Fuse The fuse is not, however, for circuit protection. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection is required.
Error Detection	Fuse blown detection
Other Functions	• DO-00 DO-00 is shared with counter position detection.

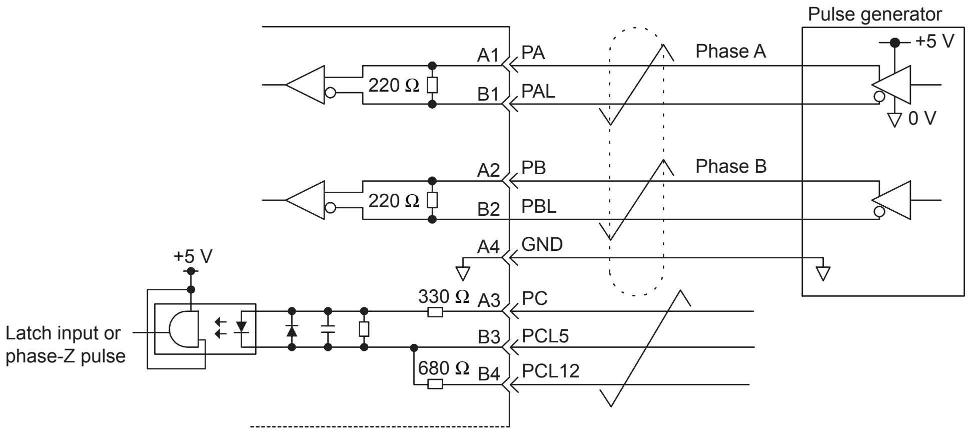


Digital Output Circuit (Source Mode Output)

(h) Pulse Input Circuit

The following table shows the LIO-02 Module pulse input circuit specifications.

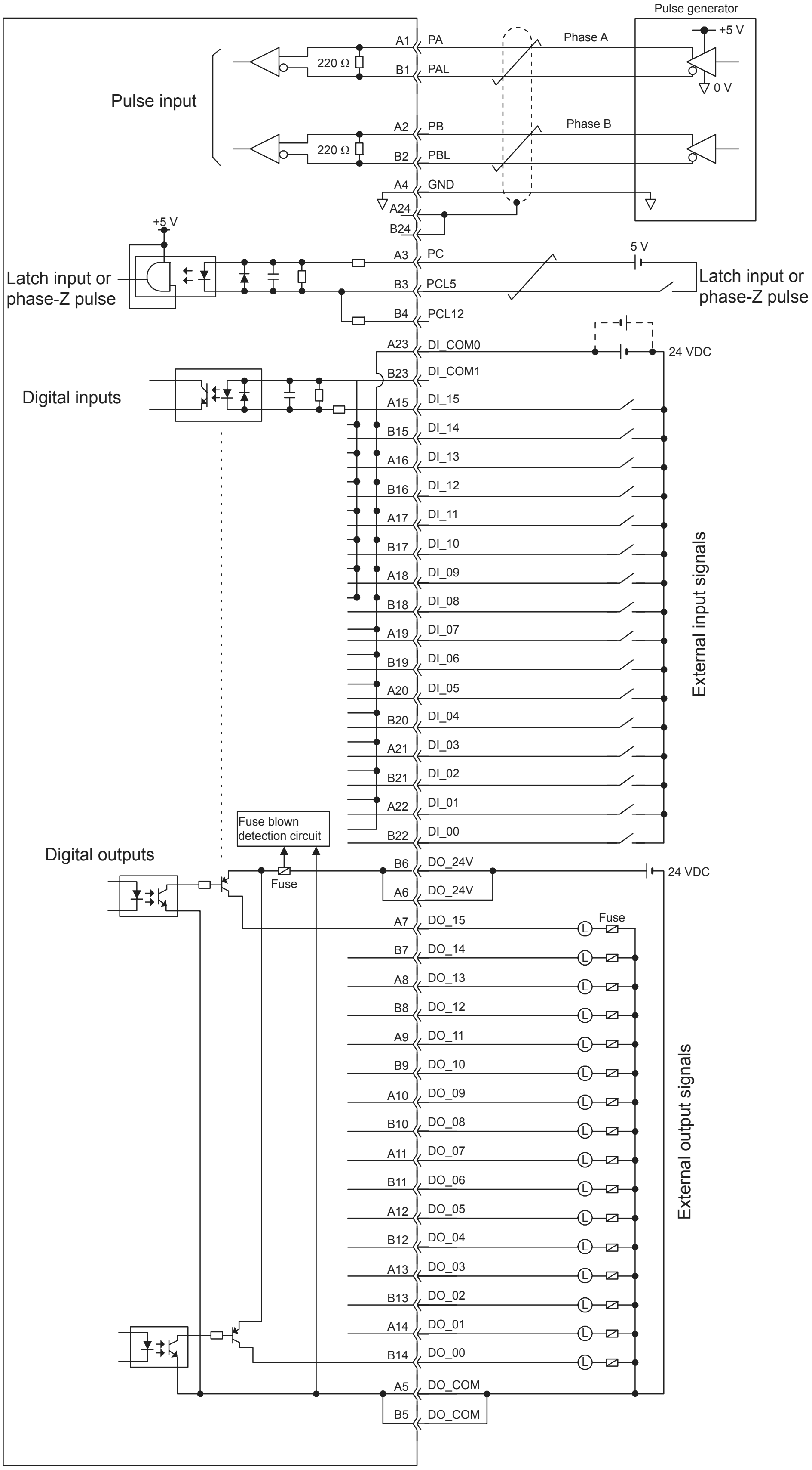
Item	Specifications
Number of Points	1 (Phase-A/B/Z input)
Input Circuit	Phase-A/B: 5-V differential input, not isolated, max. frequency: 4 MHz Phase-Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz
Input Mode	Phase-A/B, signed, incremental/decremental
Latch Input	Pulse latch on phase-Z or DI-01. Response time: 5 µs max. for phase-Z input; 60 µs max. for DI-01 input.
Other Functions	Coincidence detection, counter preset and clear



Pulse Input Circuit

(i) Module Connections

The following diagram shows a connection example for LIO-02 Module connectors.



Note: Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.

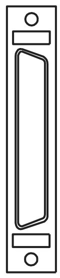
5.2.5 LIO-04 Module Connections

This section explains the connections for the LIO-04 Module.

(1) Connection Cables

(a) Connectors

The following diagram shows the LIO-04 Module connector.



The connectors connect the LIO-04 Module to I/O signals.
They are connected using the following standard cable.

- JEPMC-W6060-□□

Number of inputs: 32 (8/common)
Input mode: Source/sink mode inputs
Number of outputs: 32 (8/common)
Output mode: Sink mode outputs
CN1 and CN2 each connect to 16 inputs and 16 outputs.

(b) Connector Specifications

The following table shows the connector specifications.

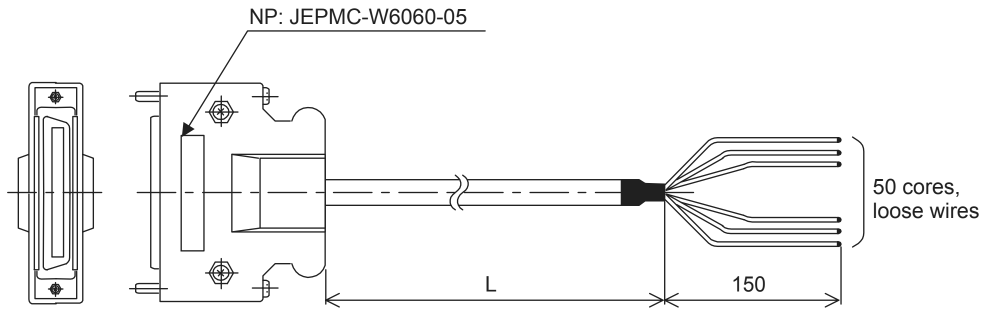
Name	Connector Name	No. of Pins	Connector Model			Cable Models
			Module side	Cable side	Manu-facturer	
External I/O connector 1	CN1	50	10250-52A3JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw locking) 10350-52F0-008 (One-touch locking)	3M	JEPMC-W6060-□□
External I/O connector 2	CN2	50	10250-52A3JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw locking) 10350-52F0-008 (One-touch locking)	3M	JEPMC-W6060-□□

(c) External I/O Cables

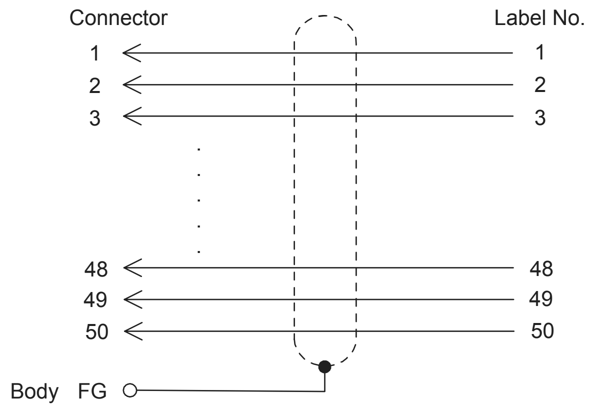
- Cables

Name	Model	Length
Cable for LIO-04 Modules	JEPMC-W6060-05	0.5 m
	JEPMC-W6060-10	1 m
	JEPMC-W6060-30	3 m

- Cable Appearance



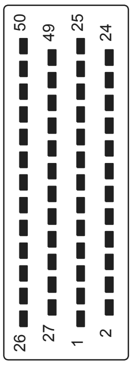
- Cable Connections Diagram



(d) Connector Pin Arrangement

The following table shows the connector pin arrangement for LIO-04 Modules.

- CN1 Pin Arrangement



Arrangement from Connection Side

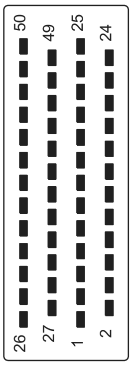
2	DI-00	1	COM-1	27	DI-01	26	–
4	DI-04	3	DI-02	29	DI-05	28	DI-03
6	COM-2	5	DI-06	31	–	30	DI-07
8	DI-10	7	DI-08	33	DI-11	32	DI-09
10	DI-14	9	DI-12	35	DI-15	34	DI-13
12	DO-00	11	–	37	DO-01	36	–
14	–	13	DI-02	39	0V-1	38	DO-03
16	DO-04	15	+24V-1	41	DO-05	40	–
18	–	17	DO-06	43	0V-1	42	DO-07
20	DO-10	19	DO-08	45	DO-11	44	DO-09
22	+24V-2	21	–	47	–	46	0V-2
24	DO-14	23	DO-12	49	DO-15	48	DO-13
		25	–			50	0V-2

5

The following figure shows the pin names and assignments for connector CN1.

No.	Signal Name	Details	No.	Signal Name	Details
1	COM-1	Common 1	26	–	–
2	DI-00	Digital input 0 (also used as interrupt input)	27	DI-01	Digital input 1 (also used as interrupt input)
3	DI-02	Digital input 2	28	DI-03	Digital input 3
4	DI-04	Digital input 4	29	DI-05	Digital input 5
5	DI-06	Digital input 6	30	DI-07	Digital input 7
6	COM-2	Common 2	31	–	–
7	DI-08	Digital input 8	32	DI-09	Digital input 9
8	DI-10	Digital input 10	33	DI-11	Digital input 11
9	DI-12	Digital input 12	34	DI-13	Digital input 13
10	DI-14	Digital input 14	35	DI-15	Digital input 15
11	–	–	36	–	–
12	DO-00	Digital output 0	37	DO-01	Digital output 1
13	DO-02	Digital output 2	38	DO-03	Digital output 3
14	–	–	39	0V-1	Common ground 1
15	+24V-1	24-V power supply 1	40	–	–
16	DO-04	Digital output 4	41	DO-05	Digital output 5
17	DO-06	Digital output 6	42	DO-07	Digital output 7
18	–	–	43	0V-1	Common ground 1
19	DO-08	Digital output 8	44	DO-09	Digital output 9
20	DO-10	Digital output 10	45	DO-11	Digital output 11
21	–	–	46	0V-2	Common ground 2
22	+24V-2	24-V power supply 2	47	–	–
23	DO-12	Digital output 12	48	DO-13	Digital output 13
24	DO-14	Digital output 14	49	DO-15	Digital output 15
25	–	–	50	0V-2	Common ground 2

- CN2 Pin Arrangement



Arrangement from Connection Side

2	DI-16	1	COM-3	27	DI-17	26	–
4	DI-20	3	DI-18	29	DI-21	28	DI-19
6	COM-4	5	DI-22	31	–	30	DI-23
8	DI-26	7	DI-24	33	DI-27	32	DI-25
10	DI-30	9	DI-28	35	DI-31	34	DI-29
12	DO-16	11	–	37	DO-17	36	–
14	–	13	DI-18	39	0V-3	38	DO-19
16	DO-20	15	+24V-3	41	DO-21	40	–
18	–	17	DO-22	43	0V-3	42	DO-23
20	DO-26	19	DO-24	45	DO-27	44	DO-25
22	+24V-4	21	–	47	–	46	0V-4
24	DO-30	23	DO-28	49	DO-31	48	DO-29
		25	–			50	0V-4

The following figure shows the pin names and assignments for connector CN2.

No.	Signal Name	Details	No.	Signal Name	Details
1	COM-3	Common 3	26	–	–
2	DI-16	Digital input 16 (also used as interrupt input)	27	DI-17	Digital input 17 (also used as interrupt input)
3	DI-18	Digital input 18	28	DI-19	Digital input 19
4	DI-20	Digital input 20	29	DI-21	Digital input 21
5	DI-22	Digital input 22	30	DI-23	Digital input 23
6	COM-4	Common 4	31	–	–
7	DI-24	Digital input 24	32	DI-25	Digital input 25
8	DI-26	Digital input 26	33	DI-27	Digital input 27
9	DI-28	Digital input 28	34	DI-29	Digital input 29
10	DI-30	Digital input 30	35	DI-31	Digital input 31
11	–	–	36	–	–
12	DO-16	Digital output 16	37	DO-17	Digital output 17
13	DO-18	Digital output 18	38	DO-19	Digital output 19
14	–	–	39	0V-3	Common ground 3
15	+24V-3	24-V power supply 3	40	–	–
16	DO-20	Digital output 20	41	DO-21	Digital output 21
17	DO-22	Digital output 22	42	DO-23	Digital output 23
18	–	–	43	0V-3	Common ground 3
19	DO-24	Digital output 24	44	DO-25	Digital output 25
20	DO-26	Digital output 26	45	DO-27	Digital output 27
21	–	–	46	0V-4	Common ground 4
22	+24V-4	24-V power supply 4	47	–	–
23	DO-28	Digital output 28	48	DO-29	Digital output 29
24	DO-30	Digital output 30	49	DO-31	Digital output 31
25	–	–	50	0V-4	Common ground 4

(2) I/O Circuit Details

(a) Interrupts

The interrupt outputs from the LIO-04 to the MP2200/MP2300 CPU are DI-00, DI-01, DI-16, and DI-17 (DINT).

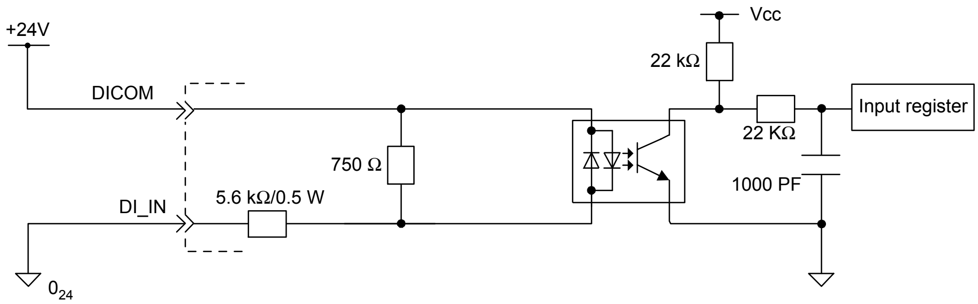
These are input to the MP2200/MP2300 CPU Unit as optional interrupts.

(b) Input Circuits

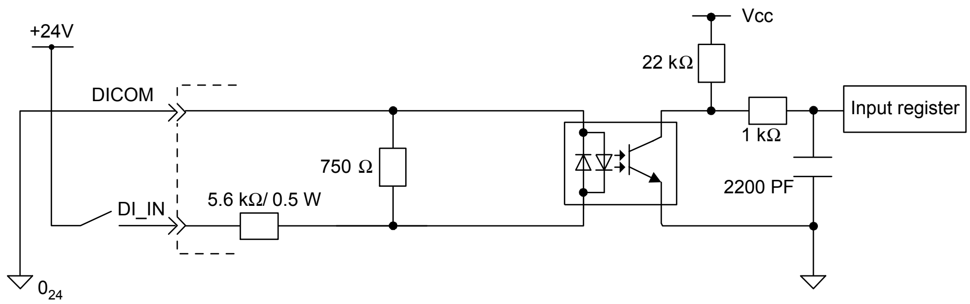
The following table shows the LIO-04 Module input circuit specifications.

Item	Specifications
Inputs*	32 points
Input Mode	Sink mode/source mode inputs
Isolation Method	Photocoupler
Input Voltage	+24 VDC ±20%
Input Current	4.1 mA (typ.)
ON Voltage/Current	15 V min./20 mA min.
OFF Voltage/Current	5 V max./1.0 mA max.
ON Time/OFF Time	ON: 0.5 ms max., OFF = 0.5 ms max.
Number of Points per Common	8 points (DI_COM0: DI_00 to DI_07, DI_COM1: DI_08 to DI_15, DI_COM2: DI_16 to DI_23, DI_COM3: DI_24 to DI_31)
Other Functions	• DI-00, DI-01, DI-16, and DI-17 (interrupt inputs) DI-00, DI-01, DI-16, and DI-17 can also be used as interrupt inputs. When interrupts are enabled, the interrupt drawings will be started when the input signal turns ON.

* For details on the number of simultaneously ON points, refer to *4.9.3 Hardware Specifications*.



Digital Input Circuit (Sink Mode Input)

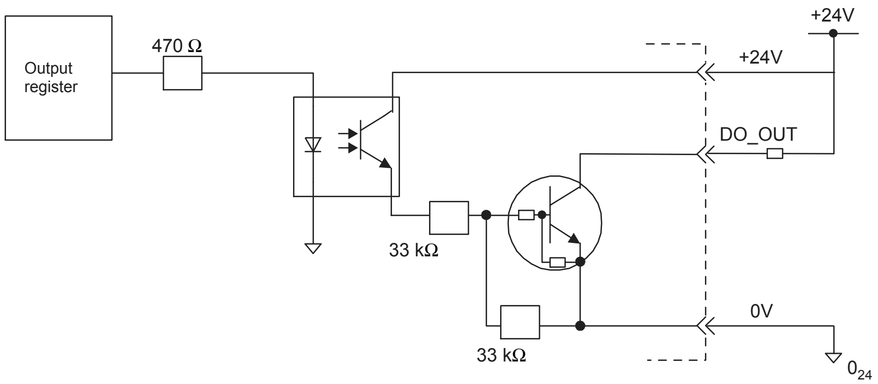


Digital Input Circuit (Source Mode Input)

(c) Output Circuits

The following table shows the LIO-04 Module output circuit specifications.

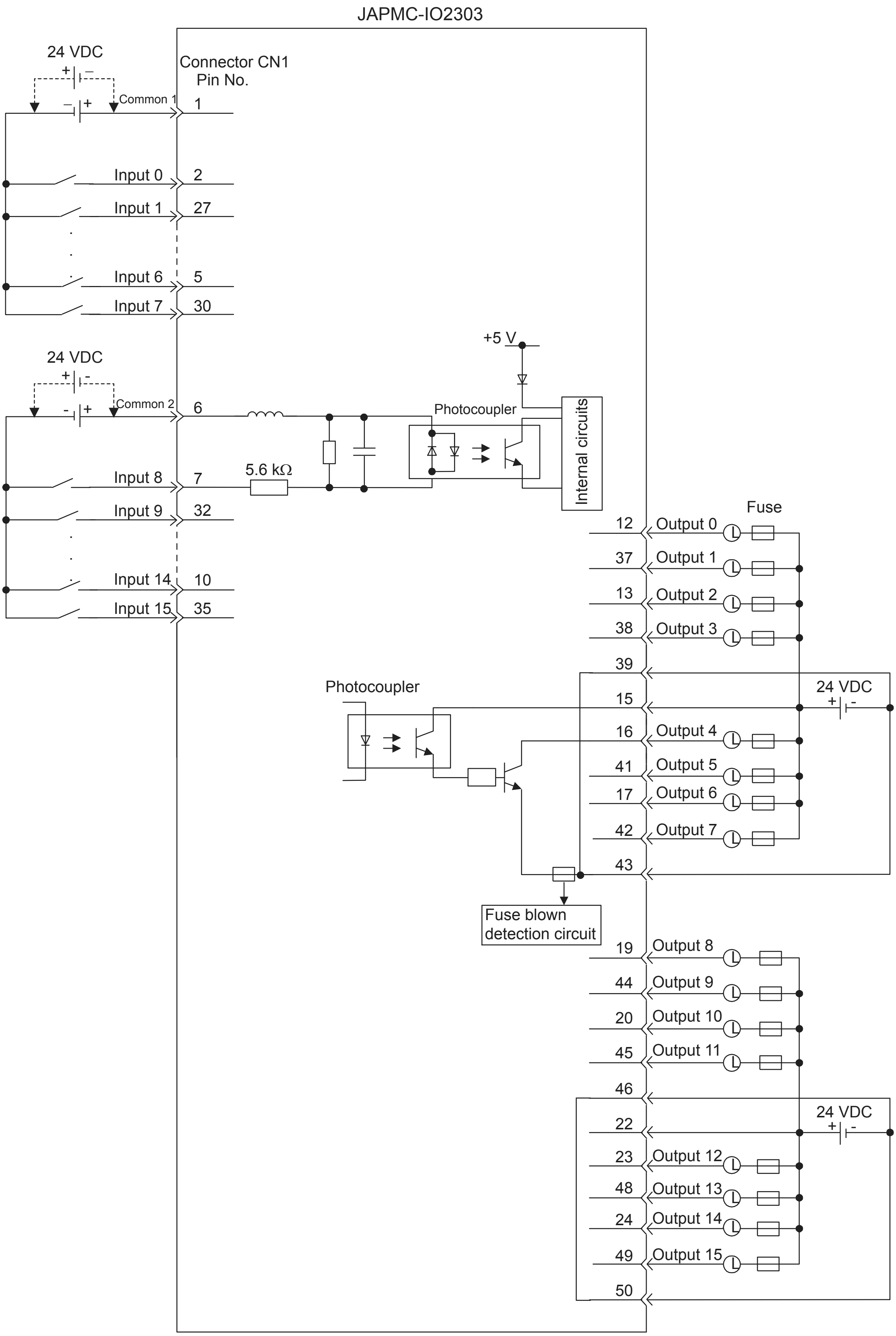
Item	Specification
Outputs	32 points
Output Mode	Transistor open collector sink mode outputs
Isolation Method	Photocoupler
Output Voltage	+24 VDC ±20%
Output Current	100 mA max.
Leakage Current when OFF	0.1 mA max.
ON Time/OFF Time	ON: 0.5 ms max., OFF: 0.5 ms max.
Number of Points per Common	8 points
Protection Circuit	There is a fuse in the common line (rating: 1 A). The fuse is not, however, for circuit protection. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection if required.
Error Detection	Fuse blown detection



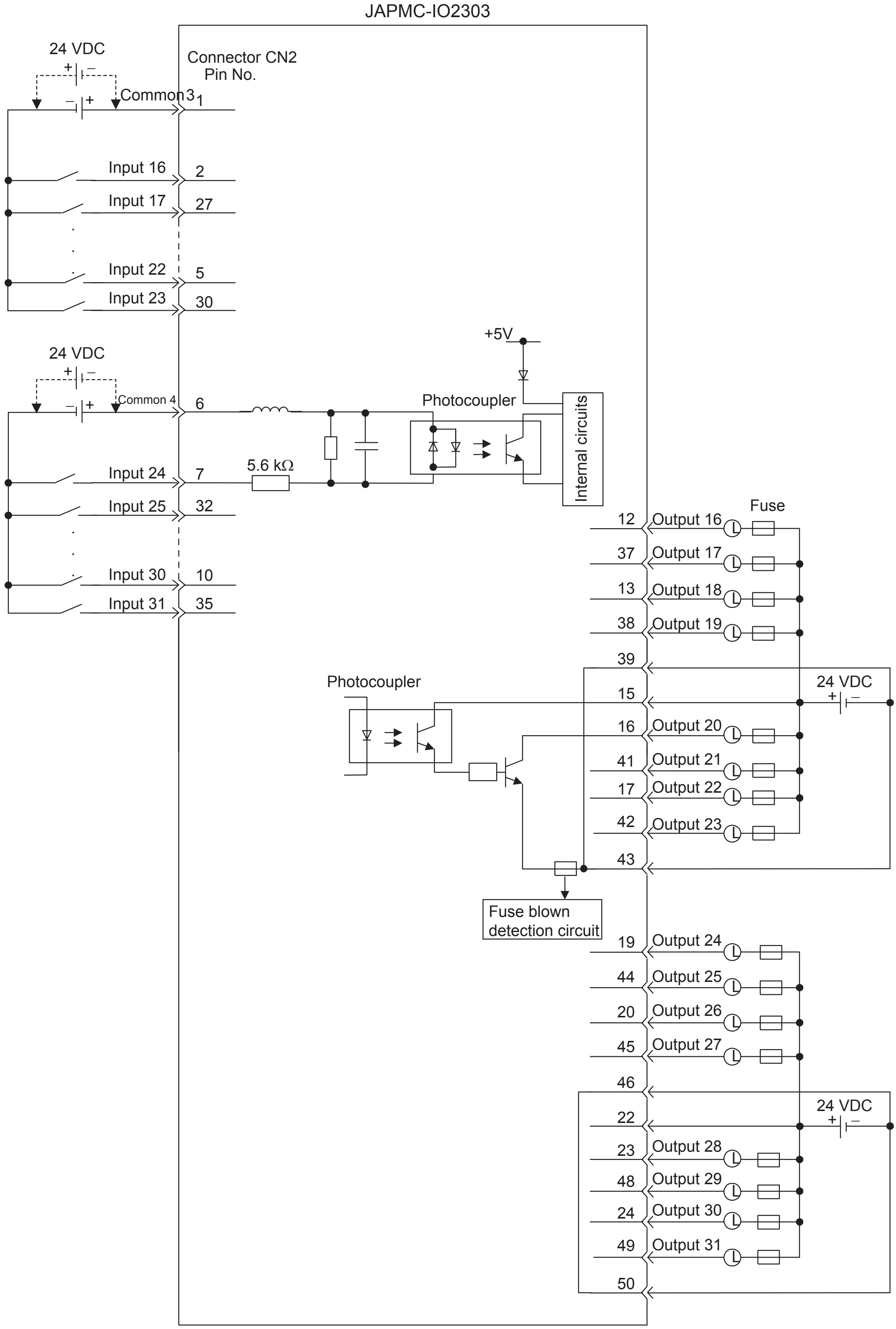
Digital Output Circuit (Sink Mode Output)

(3) LIO-04 Module Connection Examples

(a) CN1 Connector Connections



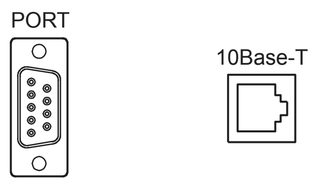
(b) CN2 Connector Connections



5.2.6 218IF-01 Module Connections

(1) Connectors

The following diagram shows 218IF-01 Module connectors.



RS-232C   Ethernet

(2) Connector Specifications

The following table shows the connector specifications.

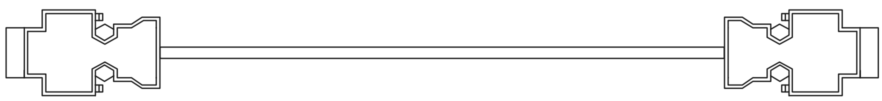
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RS-232C	PORT	9	17LE-13090-27(D2BC) 9-pin D-sub (female)	17JE-23090-02（D8B） 9-pin D-sub (male)	DDK Ltd.
Ethernet	10Base-T	8	555153-1 10Base-T Ethernet connector (modular jack)	–	Tyco Electronics AMP K.K.

(3) Cables

Name	Model	Length
RS-232C Cable	JEPMC-W5311-03	2.5 m
	JEPMC-W5311-15	15 m

(4) External Appearance of Cables for PORT Connector

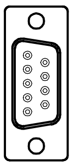
JEPMC-W5311-□□



(5) Connector Pin Arrangement

(a) PORT Connector

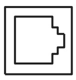
The PORT connector is used to connect the MP2200 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	–	–
4	RS	Request to send	9	ER	Data terminal ready
5	CS	Clear to send	–	–	–

(b) Ethernet Connector (10Base-T)

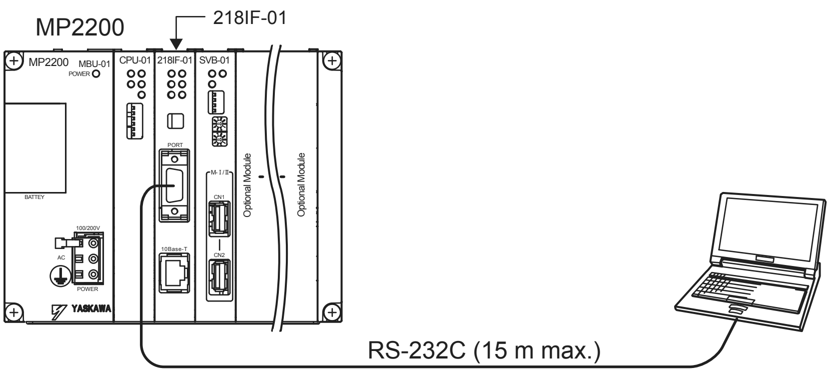
The Ethernet connector is used to connect the MP2200 to computers and HMI devices via an Ethernet (10Base-T) connection.



Pin Number	Signal Name	Description
1	TXD+	Transmission data +
2	TXD–	Transmission data –
3	RXD+	Reception data +
4	–	–
5	–	–
6	RXD–	Reception data –
7	–	–
8	–	–

(6) Module Connection Examples

(a) PORT Connector Connections



The following tables show the PORT connector connections based on the device to be connected.

Table 5.2 For 25-pin D-sub Remote Stations

MP2200 (PORT Connector)		Cable Connection and Signal Direction	Remote Station (25-pin D-sub)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS (RTS)	4		4	RS (RTS)
CS (CTS)	5		5	CS (CTS)
–	6		6	DSR (DR)
SG (GND)	7		7	SG (GND)
–	8		8	CD
ER (DTR)	9		20	DTR (ER)

Table 5.3 For 9-pin D-sub Remote Station Meeting Yaskawa Specifications

MP2200 (PORT Connector)		Cable Connection and Signal Direction	Remote Station (9-pin D-sub) (Yaskawa Specifications)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS (RTS)	4		4	RS (RTS)
CS (CTS)	5		5	CS (CTS)
–	6		6	DR (DSR)
SG (GND)	7		7	SG (GNDÅ)
–	8		8	CD
ER (DTR)	9		9	ER (DTR)

Table 5.4 For DOS Computer Remote Stations

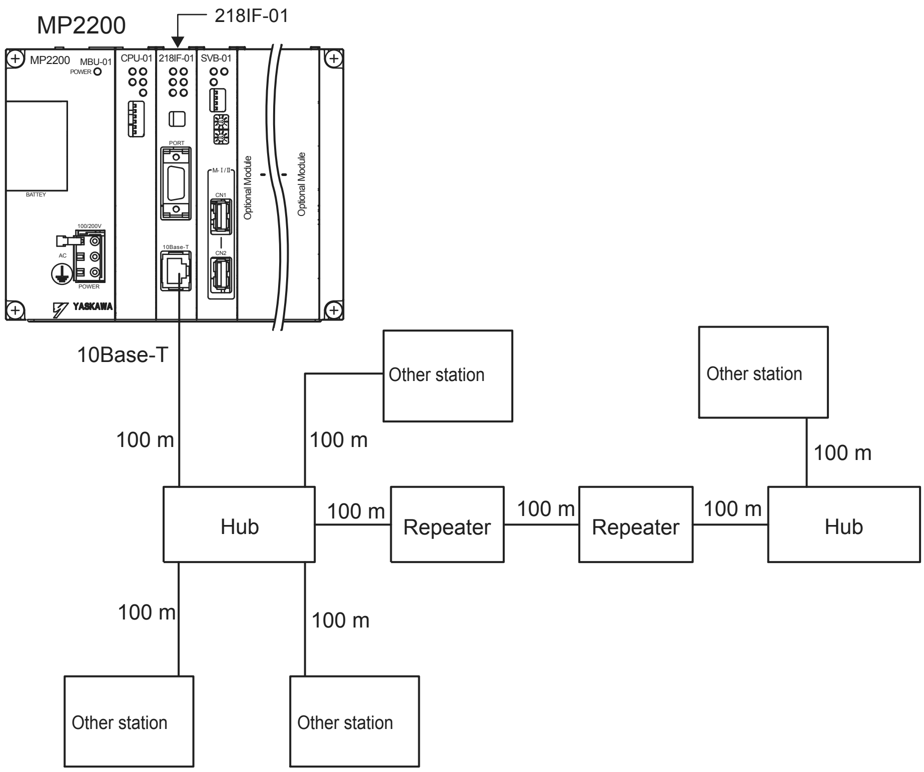
MP2200 (PORT Connector)		Cable Connection and Signal Direction	DOS Computer (9-pin D-sub Male)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	RD (RXD)
RD (RXD)	3		3	SD (TXD)
RS (RTS)	4		4	ER (DTR)
CS (CTS)	5		5	SG (GND)
–	6		6	DR (DSR)
SG (GND)	7		7	RSÅ (RTS)
–	8		8	CS (CTS)
ER (DTR)	9		9	–

(b) Ethernet Connections

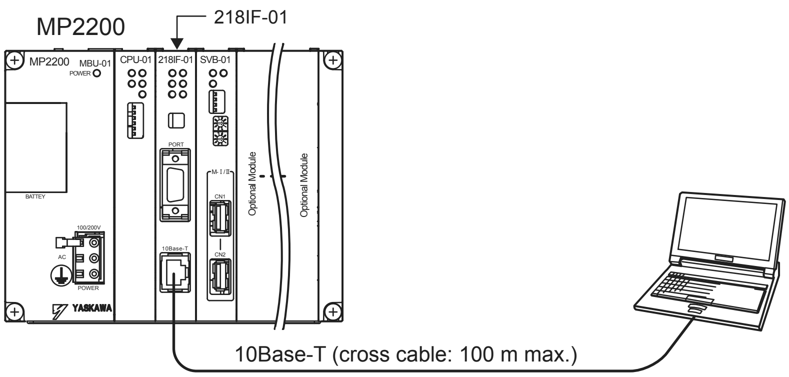
This section explains connections to the Ethernet using 10Base-T.

The maximum length between the end nodes is 500 m with 10Base-T connections.

- Connection Example 1



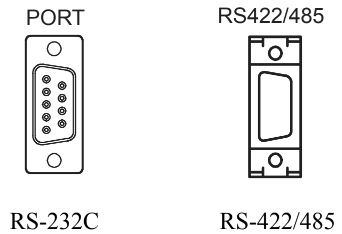
- Connection Example 2



5.2.7 217IF-01 Module Connections

(1) Connectors

The following diagram shows 217IF-01 Module connectors.



(2) Connector Specifications

The following table shows the connector specifications.

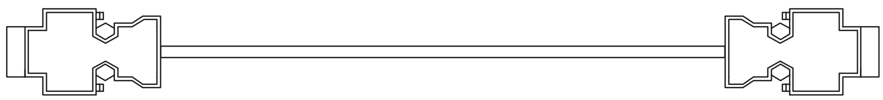
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RS-232C	PORT	9	17LE-13090-27 (D2BC) 9-pin D-sub (female)	17JE-23090-02（D8B） 9-pin D-sub (male)	DDK Ltd.
RS-422/485 port	RS-422/ 485	14	10214-52A2JL connector	10114-3000VE connector10314-52A0-008 shell	Sumitomo 3M Limited.

(3) Cables

Name	Model	Length
RS-232C Cable	JEPMC-W5311-03	2.5 m
	JEPMC-W5311-15	15 m

(4) External Appearance of Cables for PORT Connector

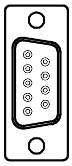
JEPMC-W5311-□□



(5) Connector Pin Arrangement

(a) PORT Connector

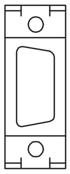
The PORT connector is used to connect the MP2200 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	–	–
4	RS	Request to send	9	ER	Data terminal ready
5	CS	Clear to send	–	–	–

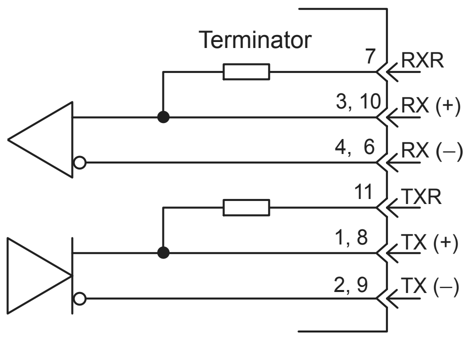
(b) RS-422/485 Connector

The RS-422/485 connector is used to connect the MP2200 to computers and HMI devices via an RS-422/485 connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	TX+	Transmission data +	8	TX+	Transmission data +
2	TX–	Transmission data –	9	TX–	Transmission data –
3	RX+	Reception data +	10	RX+	Reception data +
4	RX–	Reception data –	11	TXR	Transmission data terminator
5	–	–	12	–	–
6	RX–	Reception data -	13	VCC	Power supply (+5 V)
7	RXR	Reception data terminator	14	GND	Ground

Note: A terminator has been included, as shown in the following diagram. If you need to add a terminator, connect RXR to RX (–), and TXR to TX (–). Leave RXR and TXR open if not adding a terminator.



IMPORTANT

- Always keep the communication cable separate from the drive, control, power supply, and other transmission systems.
- The maximum length of RS-422/485 cable is 300 m. Keep all cables as short as possible.
- The 217IF-01 Module RS-422/485 interface is not an isolated system. Noise from connected terminals may cause malfunctions. If malfunctions occur, use a shielded cable, modem, or other measure to reduce noise.
- For RS-422 connections, add a terminator to the reception terminal if required.
- For RS-485 connections, add a terminator to the nodes at both ends of the transmission line.

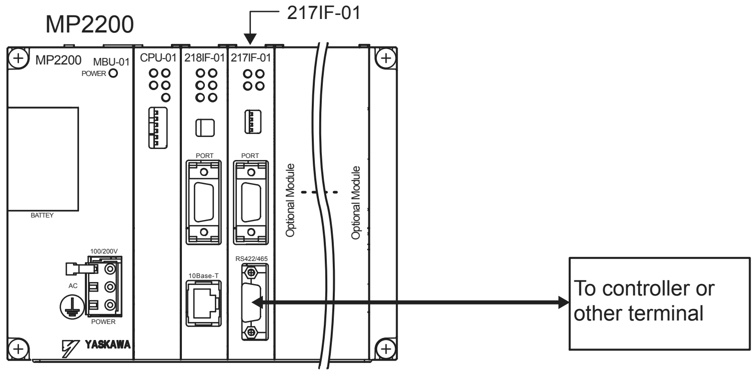
(6) Module Connection Examples

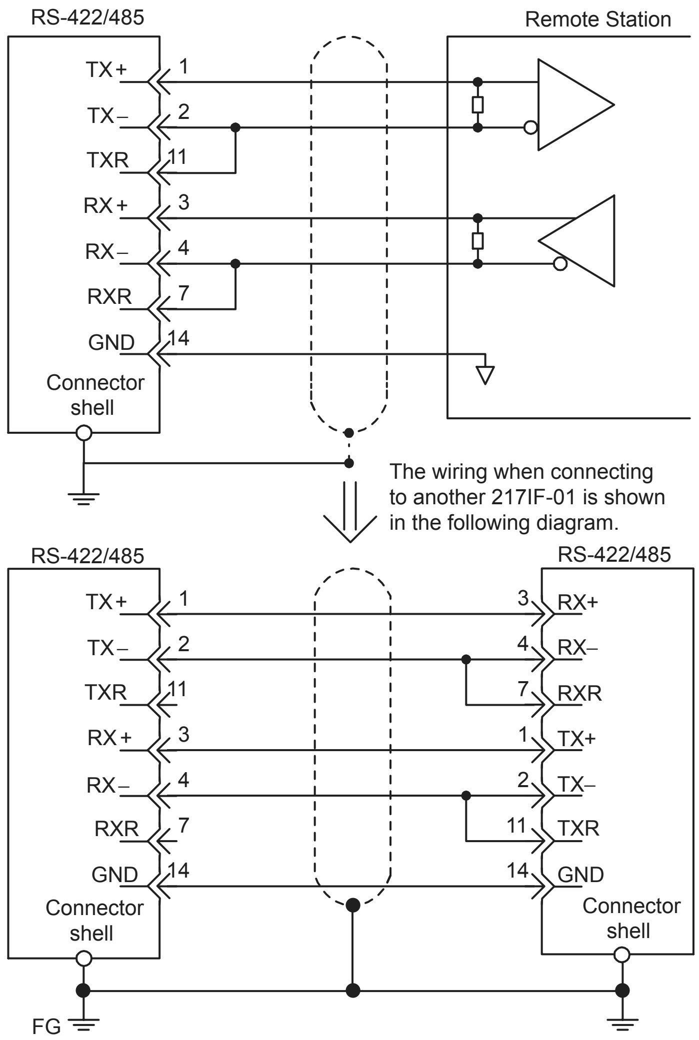
(a) PORT Connector Connections

Refer to *(a) PORT Connector Connections* under *(6) Module Connection Examples* in *5.2.6 218IF-01 Module Connections* for information on PORT connector connections.

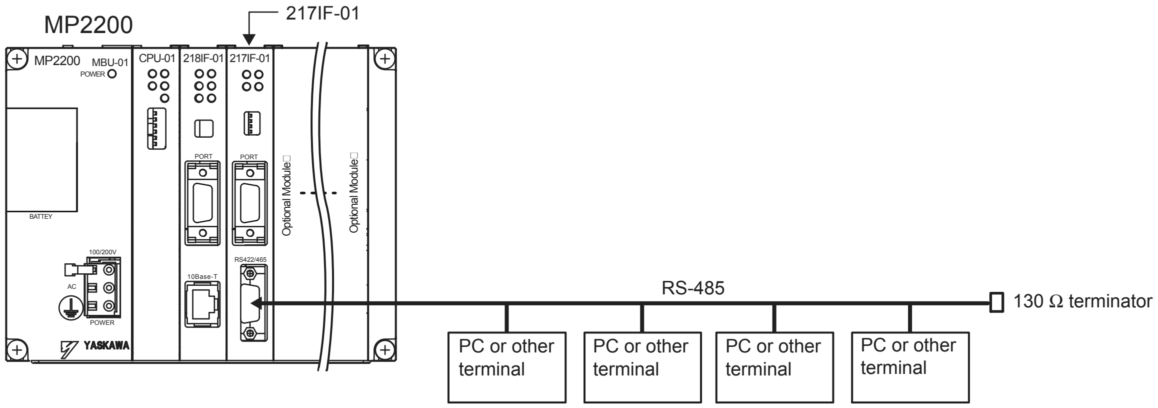
(b) RS-422/485 Connections

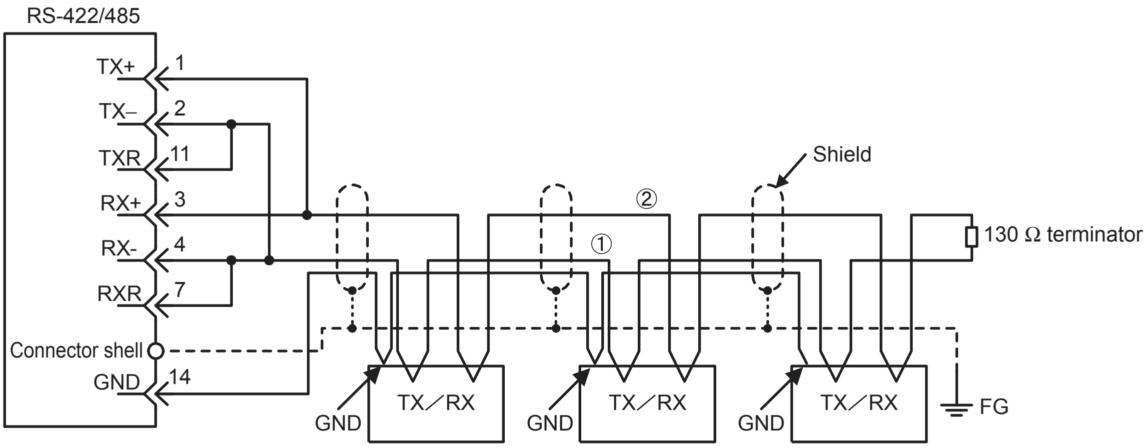
• RS-422 Wiring



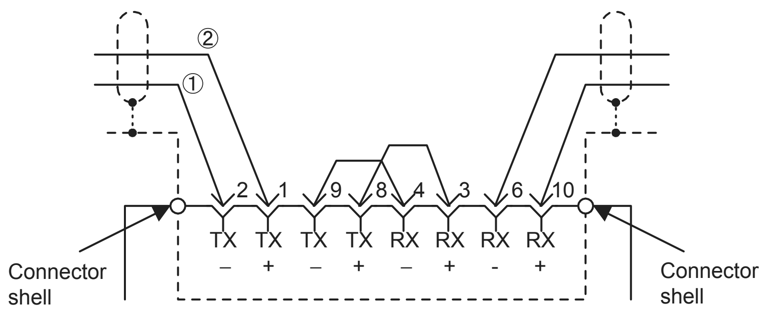


- RS-485 Wiring





The wiring when a 217IF-01 Module is connected between other nodes is shown in the following diagram.

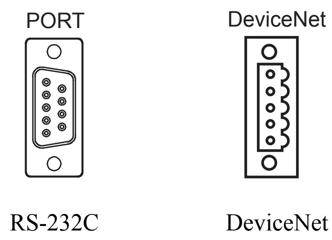


Note: The terminator is enabled by connecting terminals 2-11 and 4-7 for RS-422/485 ports.

5.2.8 260IF-01 Module Connections

(1) Connectors

The following diagram shows 260IF-01 Module connectors.



(2) Connector Specifications

The following table shows the connector specifications.

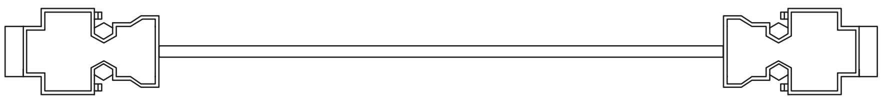
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RS-232C	PORT	9	17LE-13090-27 (D2BC) 9-pin D-sub (female)	17JE-23090-02（D8B） 9-pin D-sub (male)	DDK Ltd.
DeviceNet	DeviceNet	5	MSTB2-5/5-GF-5.08AM	–	Phoenix Contact K.K.

(3) Cables

Name	Model	Length
RS-232C Cable	JEPMC-W5311-03	2.5 m
	JEPMC-W5311-15	15 m

(4) External Appearance of Cables for PORT Connector

JEPMC-W5311-□□

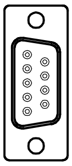


5

(5) Connector Pin Arrangement

(a) PORT Connector

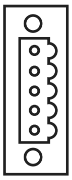
The PORT connector is used to connect the MP2200 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	–	–
4	RS	Request to send	9	ER	Data terminal ready
5	CS	Clear to send	–	–	–

(b) DeviceNet Connector

The DeviceNet connector is used to connect the MP2200 to computers and peripheral devices via a DeviceNet connection.



Pin Number	Signal Name	Description
1	V-	0-V external power supply for communication
2	CAN-L	CAN bus line dominant L
3	SHIELD	–
4	CAN-H	CAN bus line dominant H
5	V+	24-V external power supply for communication

(6) Module Connection Examples

(a) PORT Connector Connections

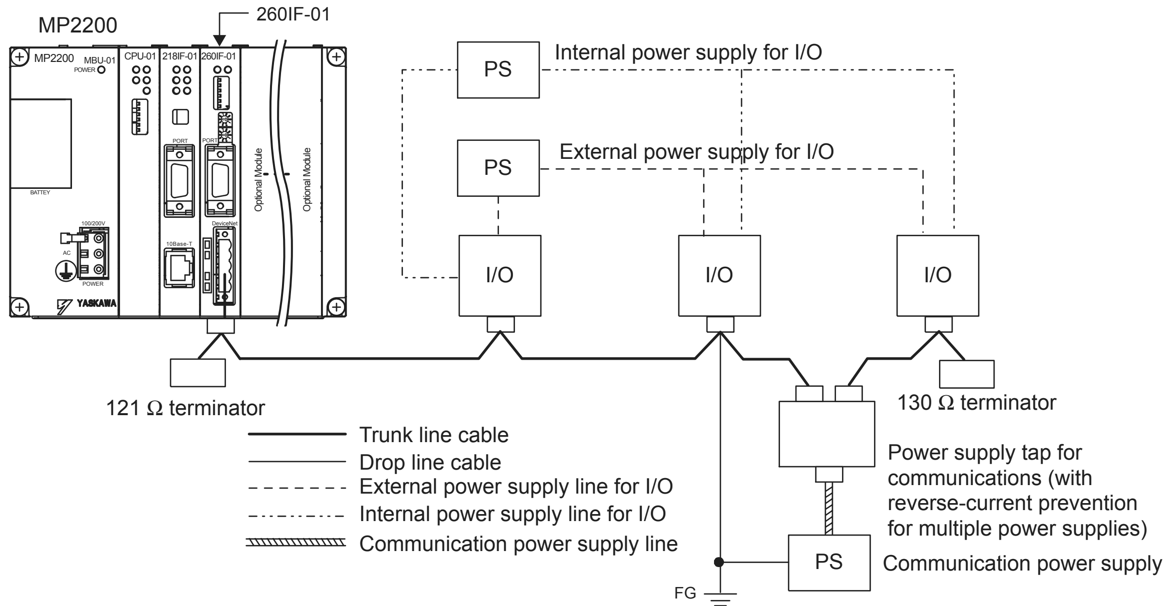
Refer to *(a) PORT Connector Connections* under *(6) Module Connection Examples* in *5.2.6 218IF-01 Module Connections* for information on PORT connector connections.

(b) DeviceNet Connections

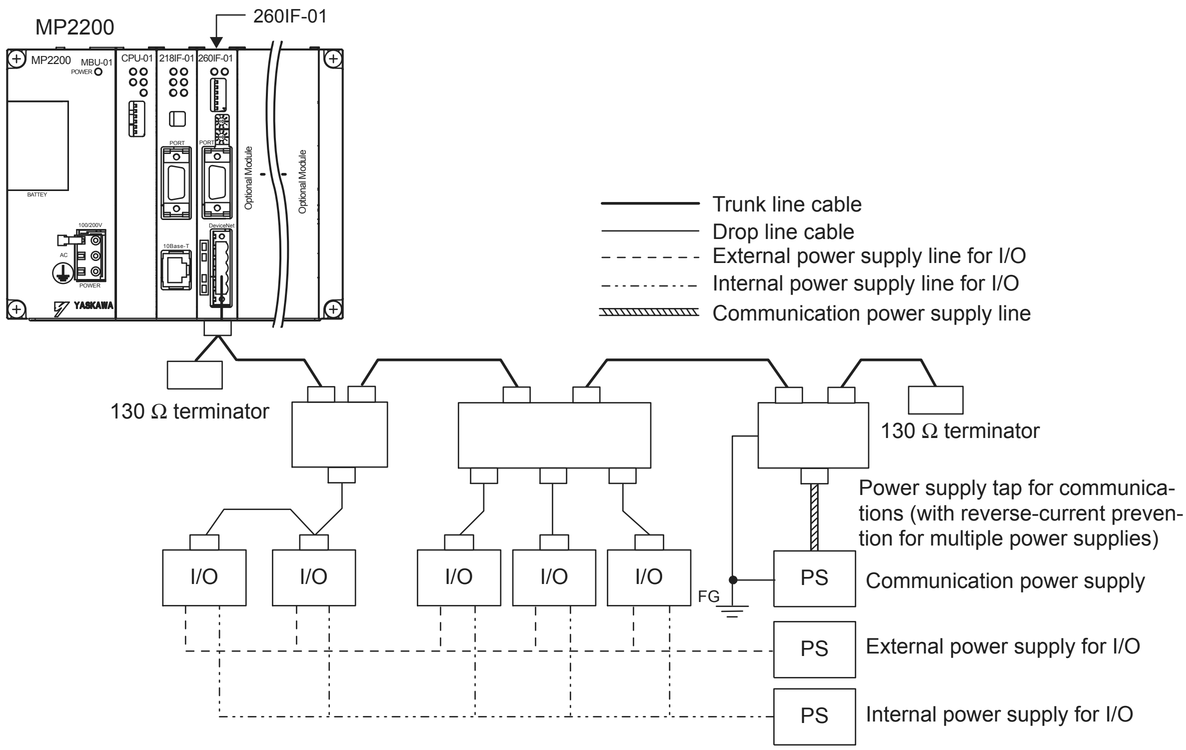
- Master Mode

There are two connection methods for master mode.

a) Multi-drop Connections

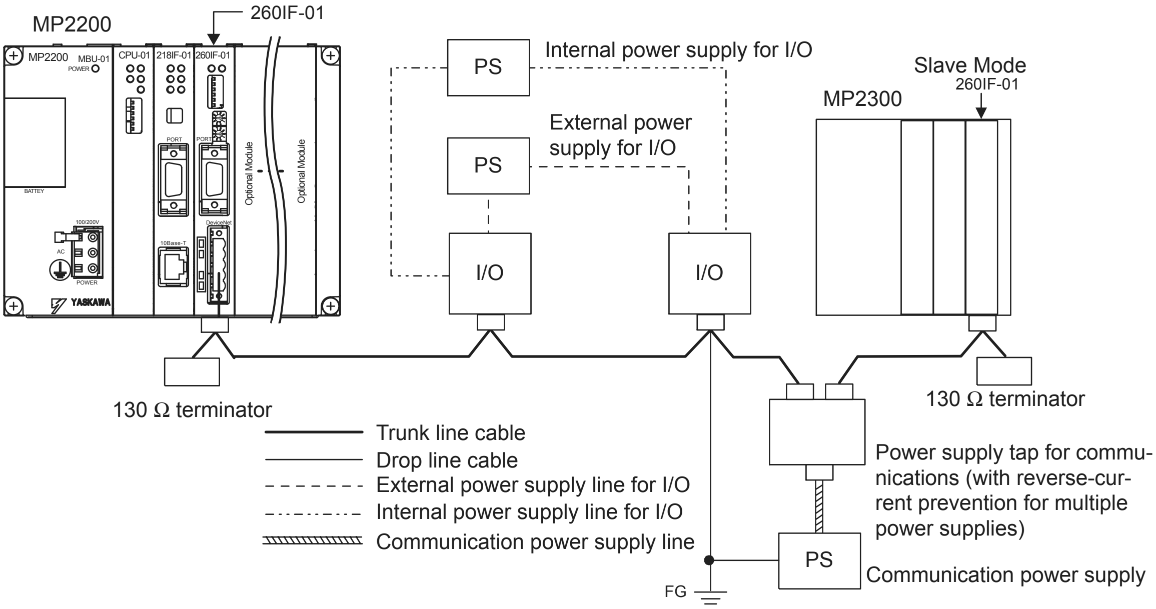


b) T-branch, Multi-branch, and Drop-line Connections



- Slave Mode

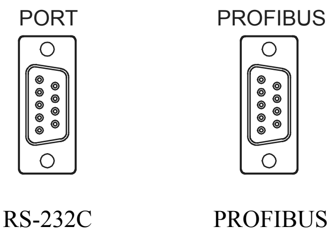
The following diagram shows the system configuration for slave mode.



5.2.9 261IF-01 Module Connections

(1) Connectors

The following diagram shows 261IF-01 Module connectors.



(2) Connector Specifications

The following table shows the connector specifications.

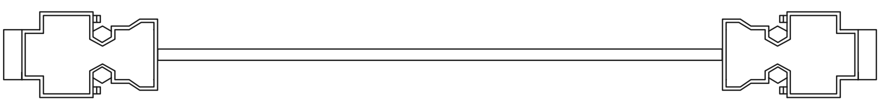
Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RS-232C	PORT	9	17LE-13090-27 (D2BC) 9-pin D-sub (female)	17JE-23090-02（D8B）9-pin D-sub (male)	DDK Ltd.
PROFIBUS	PROFIBUS	9	17LE-13090-27 (D33C) 9-pin D-sub (female)	–	DDK Ltd.

(3) Cables

Name	Model	Length
RS-232C Cable	JEPMC-W5311-03	2.5 m
	JEPMC-W5311-15	15 m

(4) External Appearance of Cables for PORT Connector

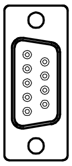
JEPMC-W5311-□□



(5) Connector Pin Arrangement

(a) PORT Connector

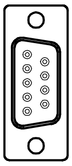
The PORT connector is used to connect the MP2200 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	–	–
4	RS	Request to send	9	ER	Data terminal ready
5	CS	Clear to send	–	–	–

(b) PROFIBUS Connector

The PROFIBUS connector is used to connect to masters via a PROFIBUS connection.



Pin Number	Signal Name	Description
1	–	–
2	–	–
3	TXD/RDX+	Transmission and reception (+)
4	RTS	Request to send
5	GND	Ground
6	+5V	External power supply
7	–	–
8	TXD/RDX-	Transmission and reception data -
9	–	–

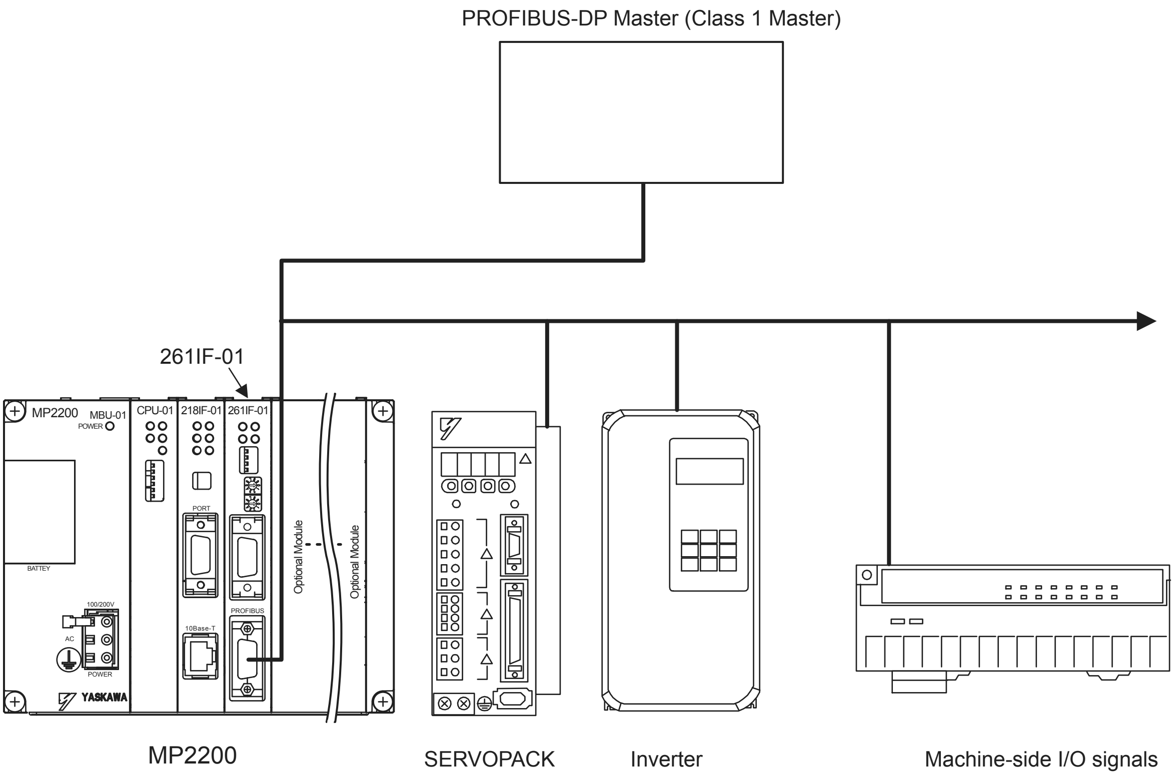
(6) Module Connection Examples

(a) PORT Connector Connections

Refer to *(a) PORT Connector Connections* under *(6) Module Connection Examples* in *5.2.6 218IF-01 Module Connections* for information on PORT connector connections.

(b) PROFIBUS Connections

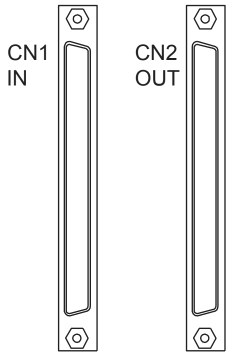
The 261IF-01 Module supports only slave mode. The slave address can be set between 1 and 64.



5.2.10 EXIOIF Module Connections

(1) Connectors

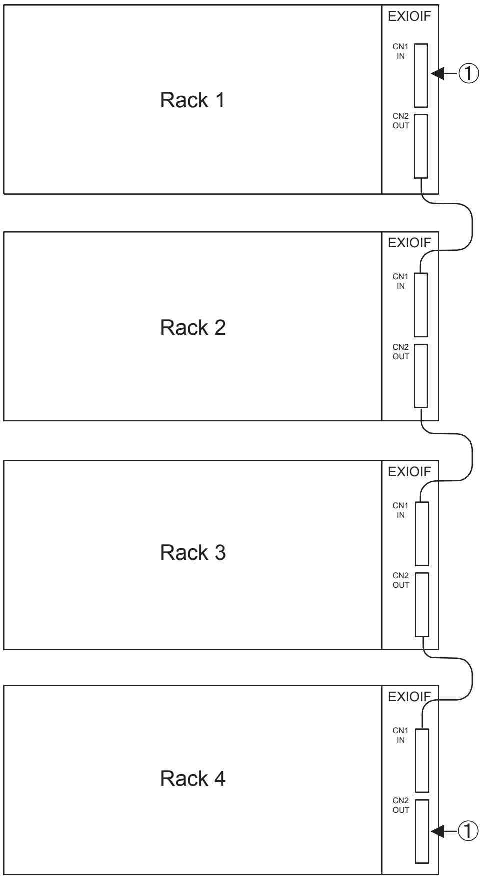
The following diagram shows EXIOIF Module connectors.



These connectors are use to expand the number of mounting bases to a maximum of four racks. They are connected using the following cables.

• JEPMC-W2091-□□

The following diagram shows how to connect the external I/O connectors.



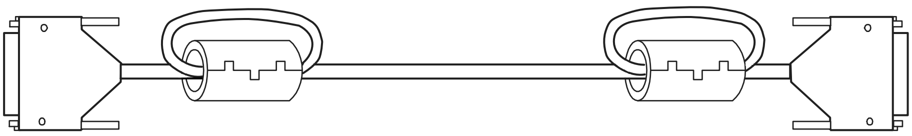
Note: Attached the enclosed dust caps to the unused connectors (1) in the above figure.

(2) Cables

Name	Model	Length
Connection Cables (with both connectors)	JEPMC-W2091-A5	0.5 m
	JEPMC-W2091-01	1.0 m
	JEPMC-W2091-2A5	2.5 m

Note: 1. The total cable length when adding expansion racks is 6.0 m. Connect the shield to the connector shell.
2. Connection method: 1:1
3. Cable Specifications: Shielded cable, equivalent to UL20276, 0.08 mm^2 (AWG28), two ferrite cores attached

(3) Cable Appearance



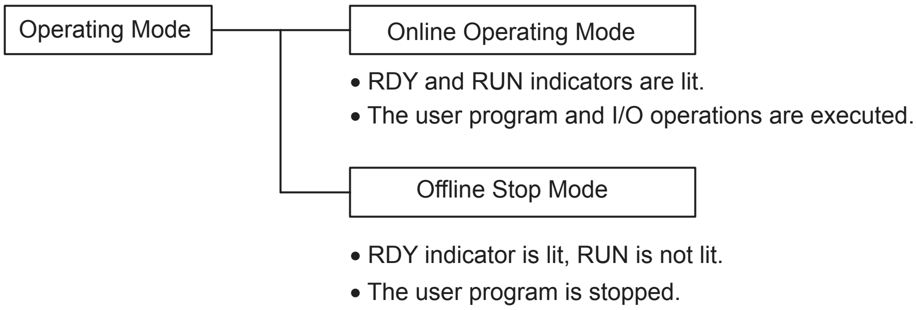
6

Basic System Operation

This chapter explains the basic operation of the MP2200 system.

6.1 Operating Mode

This section explains the online operating mode and the offline stop mode, both of which indicate the MP2200 operating status.



MP2200 Operating Modes

6.1.1 Online Operating Mode

When the power for the MP2200 is turned ON, the RDY and RUN indicators will light (the ERR and ALM indicators will not light) and the MP2200 will enter the online operating mode. This means that the user program and I/O operations are being executed in the MP2200 without any errors or failures. If an alarm does occur, such as for an I/O conversion error or a user calculation error, the execution of the user program will not stop, and the online operating mode will be maintained. The ALM indicator lights to indicate the occurrence of the error. For details on the error content and the action to be taken, see *Chapter 8 Troubleshooting*.

6.1.2 Offline Stop Mode

The execution of the user program is stopped, and all outputs are reset (i.e., 0 is output for all digital outputs). The RDY indicator will light and the RUN indicator will go OFF.

The MP2200 will be in the offline stop mode in the following cases:

- When a serious failure, such as a watchdog timeout error, has occurred*
- When a STOP operation has been performed from the MPE720
- When the STOP switch has been set to ON (user program stopped) and the power has been turned ON

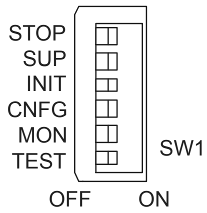
* The above case applies when a user program error occurs or when there is a hardware fault in the MP2200. For details on the error content and the action to be taken, see *Chapter 8 Troubleshooting*.

6.2 Startup Sequence and Basic Operation

This section explains the startup sequence and basic operation of the MP2200. The methods for setting the DIP switch, the types of self-diagnosis, and the indicator patterns are also explained.

6.2.1 DIP Switch Settings

The DIP switch on the CPU-01 Module is used to control the startup sequence. As shown below, there are six pins on the DIP switch. The function of each pin is given in the following table.



Pin Number	Switch Name	Status	Operating Mode	Default Setting	Details
6	STOP	ON	User program stopped	OFF	Stops user program execution. Enabled only when the power is turned ON.
		OFF	User program running		
5	SUP	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
4	INIT	ON	Memory clear	OFF	Set to ON to clear the memory. If this switch is set to OFF, the program stored in flash memory will be executed.
		OFF	Normal operation		
3	CNFG	ON	Configuration Mode	OFF	Set to ON to execute self-configuration for connected devices.
		OFF	Normal operation		
2	MON	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
1	TEST	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		

6.2.2 Indicator Patterns

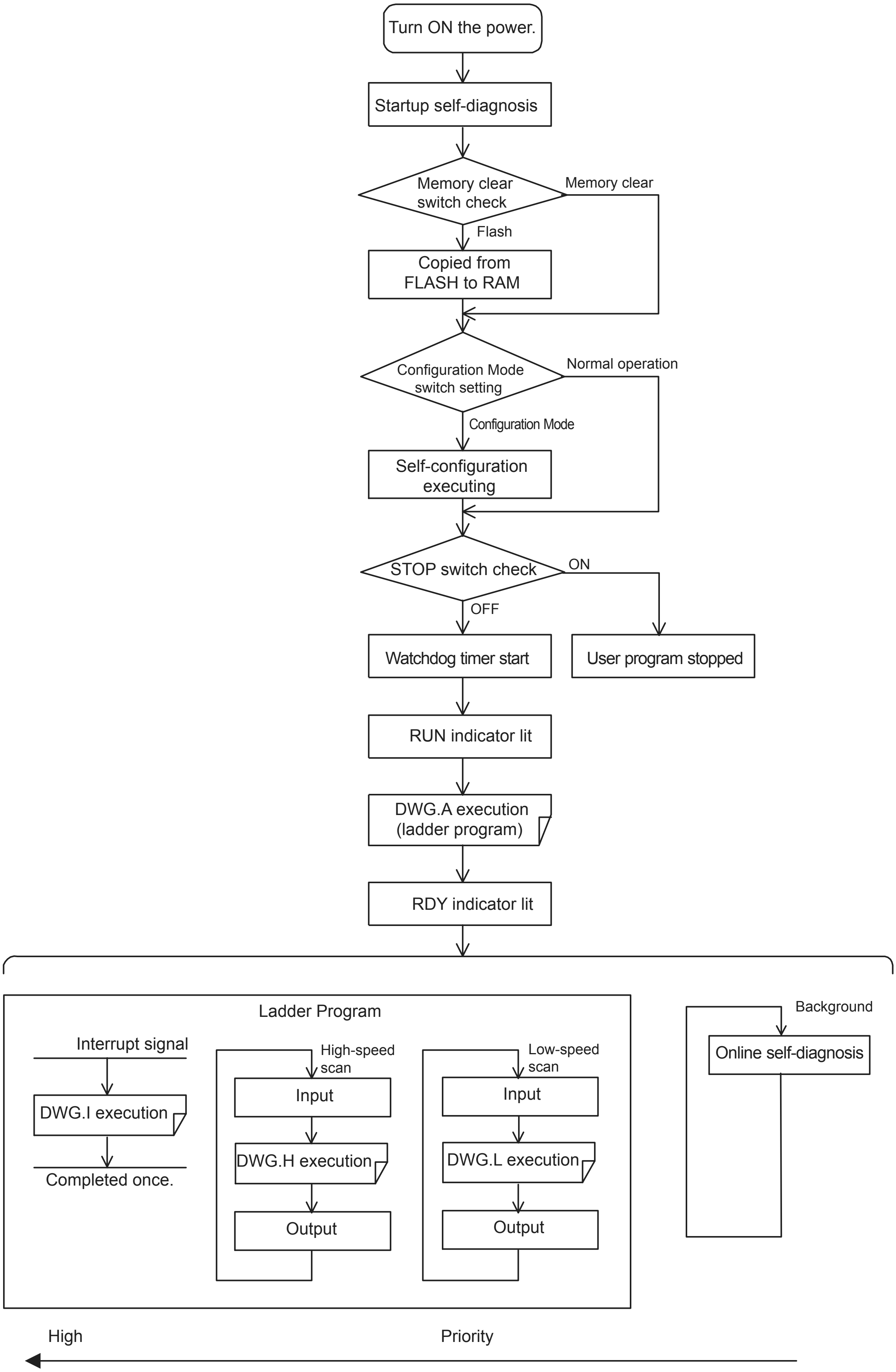
The MP2200 makes a number of determinations at startup. If an error is detected, the ERR indicator will blink and the error content will be indicated by the number of times the indicator blinks. When the indicator is blinking, the MPE720 cannot be operated. For details on the error content and the action to be taken, see *Chapter 7 Maintenance and Inspection* and *Chapter 8 Troubleshooting*. The following table shows the MP2200 indicators.

<table>
<tr><th rowspan="2">Classification</th><th colspan="5">Indicator Name</th><th rowspan="2">Indicator Details</th><th rowspan="2">Remarks</th></tr>
<tr><th>RDY</th><th>RUN</th><th>ALM</th><th>ERR</th><th>BAT</th></tr>
<tr><td rowspan="5">Normal</td><td>○</td><td>○</td><td>●</td><td>●</td><td>○</td><td>Hardware reset status</td><td rowspan="3">–</td></tr>
<tr><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>Initializing.</td></tr>
<tr><td>○</td><td>●</td><td>○</td><td>○</td><td>○</td><td>Drawing A executing.</td></tr>
<tr><td>●</td><td>○</td><td>○</td><td>○</td><td>○</td><td>User program stopped (offline stop mode).</td><td>This status is entered when STOP operation is performed from a switch or the MPE720.</td></tr>
<tr><td>●</td><td>●</td><td>○</td><td>○</td><td>○</td><td>User program executing normally.</td><td>–</td></tr>
<tr><td rowspan="3">Error</td><td>○</td><td>○</td><td>○</td><td>●</td><td>○</td><td>Serious failure</td><td>The ERR indicator lights when there is a failure in the CPU.</td></tr>
<tr><td>○</td><td>○</td><td>○</td><td>★</td><td>○</td><td>Number of blinks for software errors:
3: Address read error
4: Address write error
5: FPU error
6: Illegal general command error
7: Illegal slot command error
8: General FPU inhibited error
9: Slot FPU inhibited error
10: TLB multi-bit error
11: LTB read error
12: LTB write error
13: LTB protection violation (read)
14: LTB protection violation (write)
15: Initial page write error</td><td>The ERR indicator blinks when there is an error.</td></tr>
<tr><td>○</td><td>○</td><td>★</td><td>★</td><td>○</td><td>Number of blinks for hardware errors:
2: RAM diagnosis error
3: ROM diagnosis error
4: CPU function diagnosis error
5: FPU function diagnosis error</td><td>The ALM and ERR indicators blink when there is a self-diagnosis failure.</td></tr>
<tr><td rowspan="2">Warning</td><td>–</td><td>–</td><td>–</td><td>–</td><td>●</td><td>Battery alarm</td><td>The BAT indicator lights when the battery voltage drops.</td></tr>
<tr><td>●</td><td>●</td><td>●</td><td>○</td><td>○</td><td>Operation error
I/O error</td><td>The ALM indicator lights when a calculation or I/O error is detected.</td></tr>
</table>

Note: The symbols under Indicator Name have the following meanings.
●: Not lit, ○: Lit, ★: Blinking, –: Undefined.

6.2.3 Startup Sequence

A basic outline of the startup sequence and basic operation of the MP2200 is shown below.



(1) Startup Self-diagnosis

The following operations are provided for startup self-diagnosis:

- Memory (RAM) read/write diagnosis
- System program (ROM) diagnosis
- Main processor (CPU) function diagnosis
- Floating point unit (FPU) function diagnosis

If an error occurs in the diagnosis, the ALM and ERR indicators will blink the specified number of times.

(2) Online Self-diagnosis

The following operations are provided for online self-diagnosis:

- System program (ROM) diagnosis
- Main processor (CPU) function diagnosis
- Floating point unit (FPU) function diagnosis

If an error occurs in the diagnostic result, the ALM and ERR indicators will blink the specified number of times.

(3) Self-configuration

1. Self-configuration eliminates the need to make settings for Module definitions, making it possible to perform startup work easily and quickly for the MP2200 system. Optional Modules are recognized and definition files are generated automatically. For details, refer to *6.5 Self-configuration*.
2. The RUN indicator blinks during execution of self-configuration.

(4) Operation Start

If the Stop Switch is OFF (RUN) or if it is turned OFF (RUN) from ON (STOP), the CPU starts the watchdog timer and then executes DWG.A.

The initial scan is executed only after the time for the high-speed or low-speed scan has ended following the completion of DWG.A. System inputs and outputs are executed from the first scan.

(5) Operation Stop

The MP2200 stops operating in the following cases:

Cause	Countermeasure
The power supply is interrupted.	Turn power OFF and ON.
A power failure has occurred.	
A fatal error has occurred.	Determine the error by the indicator status and turn the power OFF and ON.
A STOP operation has been performed from the MPE720.	Perform a RUN operation from the MPE720.

6.3 User Program

The MP2200 user program includes ladder and motion programs. This section explains the basic operation of the user program. Refer to the following manuals for details on programming.

- MP900/MP2000 Series Machine Controller User's Manual: Ladder Programs (Manual No.: SIEZ-C887-1.2)
- MP900/MP2000 Series Machine Controller User's Manual: Motion Programs (Manual No.: SIEZ-C887-1.3)
- MP900/MP2000 Series Machine Controller New Ladder Editor User's Manual: Programming Instructions (Manual No.: SIEZ-C887-13.1)
- MP900/MP2000 Series Machine Controller New Ladder Editor User's Manual: Operation (Manual No.: SIEZ-C887-13.2)

6.3.1 Drawings (DWGs)

User programs are managed in units of programming called drawings. Each drawing is identified by a drawing number (DWG No.). These drawings serve as the basis of user programs.

The drawings include parent drawings, child drawings, grandchild drawings, and operation error drawings. Besides the drawings, there are functions that can be freely called from each drawing.

- Parent Drawings

  Parent drawings are executed automatically by the system program when the execution condition is established.
- Child Drawings

  Child drawings are executed by being called from a parent drawing using the SEE instruction.
- Grandchild Drawings

  Grandchild drawings are executed by being called from a child drawing using the SEE instruction.
- Operation Error Drawings

  Operation error drawings are executed automatically by the system program when an operation error occurs.
- Functions

  Functions are executed by being called from a parent, child, or grandchild drawing using the FSTART instruction.

(1) Types and Priority Levels of Drawings

Drawings are classified by the first character of the drawing number (A, I, H, L) according to the purpose of the process. The priority levels and execution conditions are as shown in the following table.

Type of Parent Drawing	Role of Drawing	Priority Level	Execution Conditions	Number of Drawings
A Drawings (DWG.A)	Startup process	1	Turn ON the power (executed once only when the power is turned ON).	64
I Drawings (DWG.I)	Interrupt process	2	Executed by external interrupts, such as Optional Module DI interrupts or counter interrupts.	64
H Drawings (DWG.H)	High-speed scan process	3	Started at a fixed interval (executed during each high-speed scan).	200
L Drawings (DWG.L)	Low-speed scan process	4	Started at a fixed interval (executed during each low-speed scan).	500

6

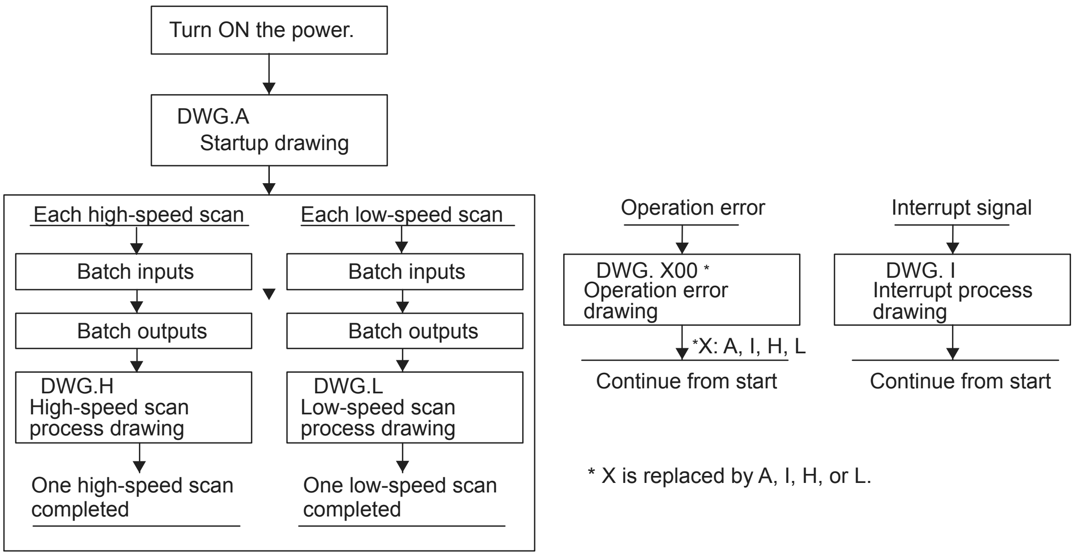
The following table gives details of the number of drawings for each type of drawing.

Drawing	Number of Drawings			
	DWG.A	DWG.I	DWG.H	DWG.L
Parent Drawing	1 (A)	1 (I)	1 (H)	1 (L)
Operation Error Drawing	1 (A00)	1 (I00)	1 (H00)	1 (L00)
Child Drawing	Maximum total of 62 drawings	Maximum total of 62 drawings	Maximum total of 198 drawings	Maximum total of 498 drawings
Grandchild Drawing				

6.3.2 Execution Control of Drawings

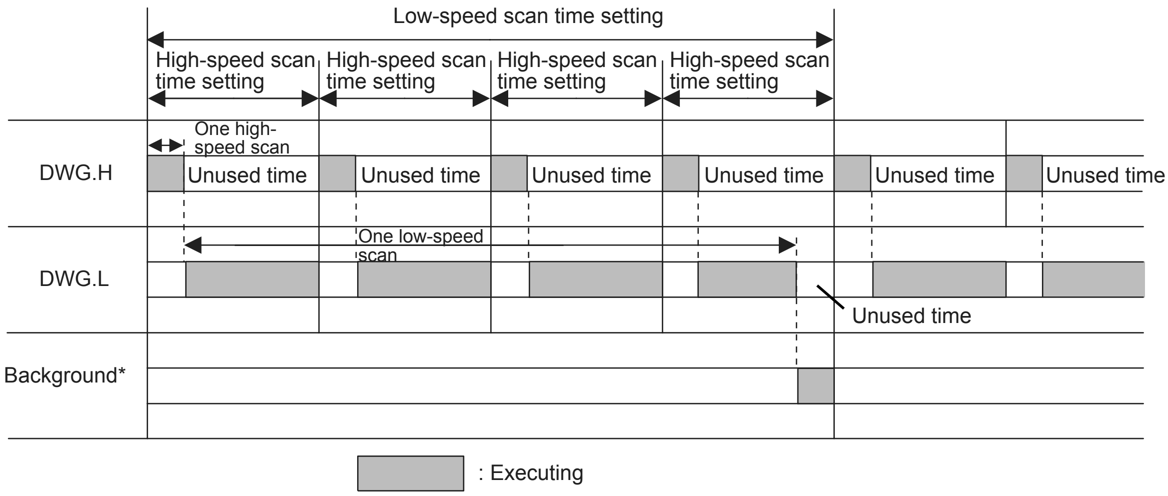
(1) Execution Control of Drawings

Each drawing is executed based on its priority level, as shown in the diagram below.



(2) Execution Scheduling of Scan Process Drawings

The scan process drawings are not executed simultaneously. As shown below, they are scheduled based on the priority level and are executed according to the schedule.



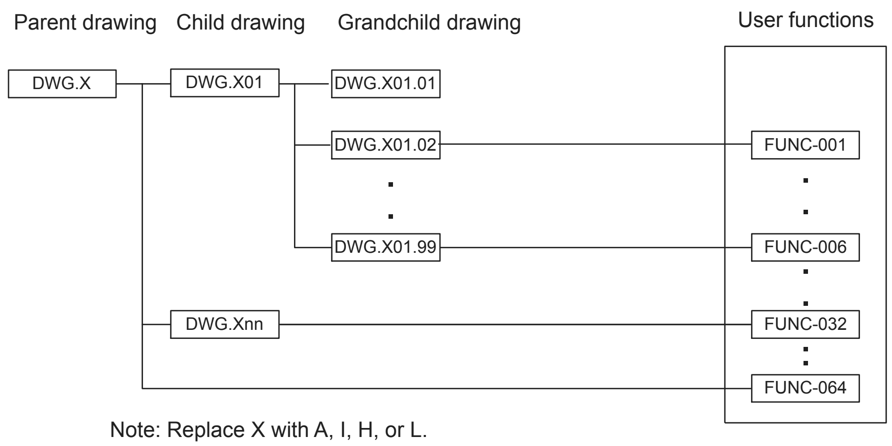
* Used for internal system processes, such as communication.

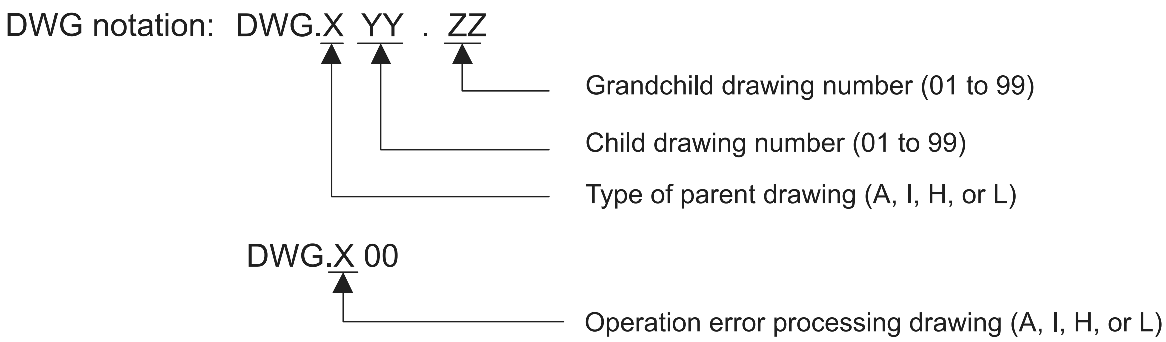
The low-speed scan process is executed in the unused time of the high-speed scan process. Therefore, as a guideline, set a time that is twice the execution time of all the DWG.H drawings as the high-speed scan time.

(3) Hierarchical Arrangement of Drawings

Drawings are arranged in the following order: Parent drawing, child drawings, grandchild drawings. A parent drawing cannot call a child drawing of a different type, and a child drawing cannot call a grandchild drawing of a different type. A parent drawing also cannot directly call a grandchild drawing. A child drawing is called from a parent drawing, and a grandchild drawing is called from that child drawing. This is called the hierarchical arrangement of drawings.

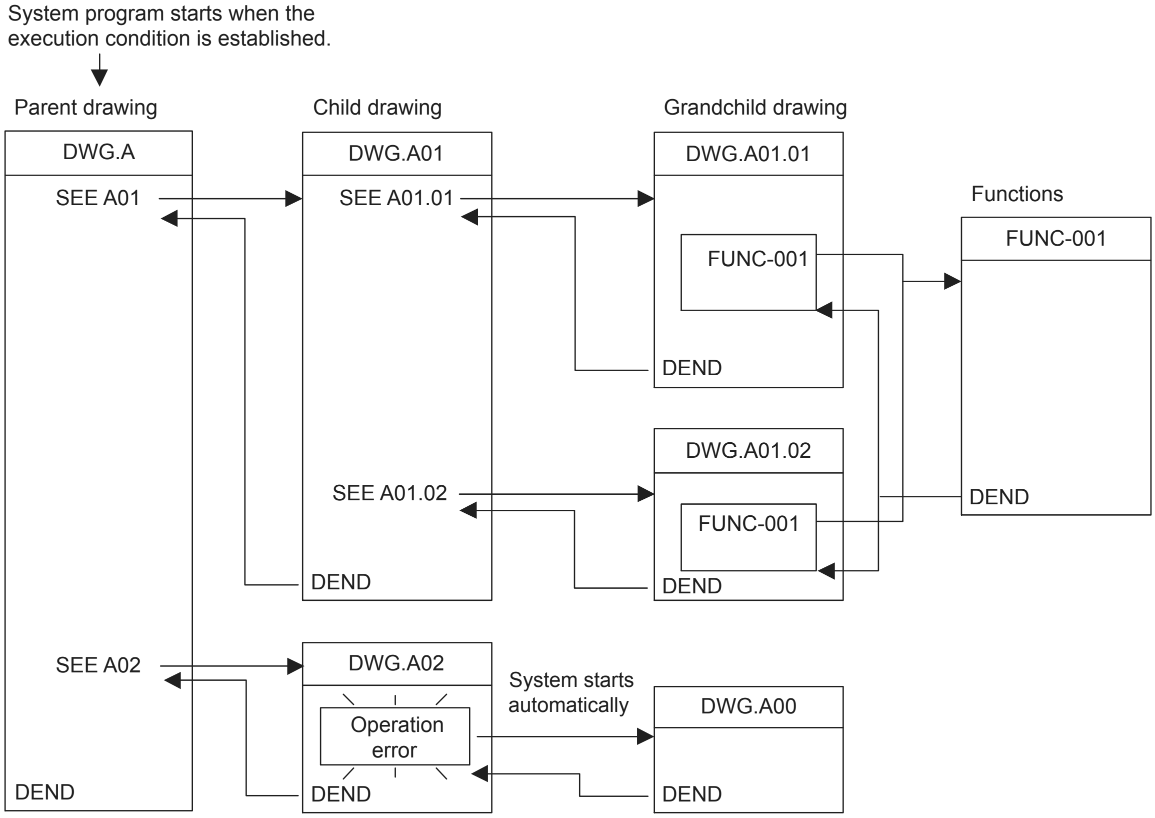
Each processing program is prepared with the parent drawing, child drawing, grandchild drawing hierarchy, as shown below.





(4) Execution Processing Method of Drawings

Drawings in the hierarchy are executed by the lower-level drawings being called from upper-level drawings. The execution method is shown below, using DWG.A as an example.



Note: 1. A parent drawing is automatically called by the system. The user can execute any child or grandchild drawing by programming an instruction that calls the drawing (the SEE instruction) in a parent or child drawing.

2. Functions can be called from any drawing. A function can also be called from a function.
3. If an operation error occurs, the operation error drawing corresponding to the drawing will be called.

6.3.3 Motion Programs

A motion program is a textual program that utilizes motion language. A maximum of 256 motion programs can be created, separate from the ladder programs.

Two types of motion program are provided.

Classification	Designation Type	Feature	Number of Programs
Main Programs	MPM□□□ 1 to 256	Can be called from DWG.H	A total of up to 256 main programs and subprograms can be created.
Subprograms	MPS□□□ 1 to 256	Can be called from the main program.	

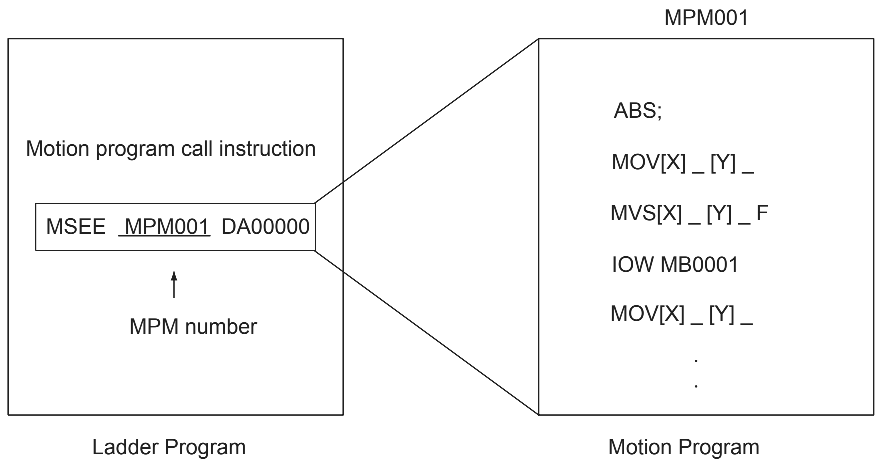
IMPORTANT

Each MPM□□□ and MPS□□□ program number must be unique.

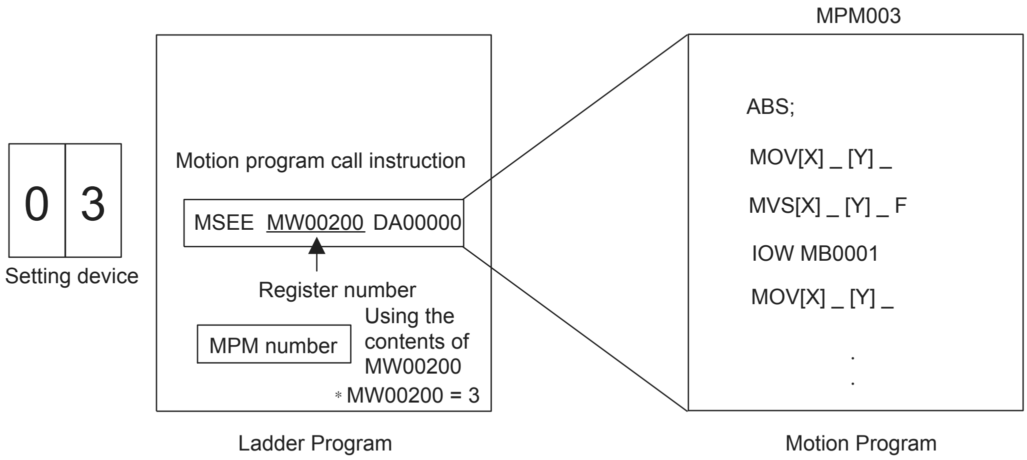
With the MP2200, up to 16 motion programs can be executed at the same time. If 17 or more motion programs are executed, an alarm (no system work error) will occur.

- No system work error: Bit E in the first word of the MSEE work registers

There are two methods of designating a motion program: Direct designation of the program number, and indirect designation of the register number in which the program number is stored.



Calling a Motion Program by Direct Designation

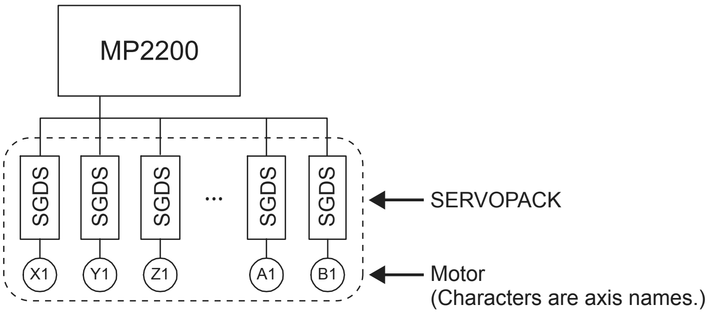


Calling a Motion Program by Indirect Designation

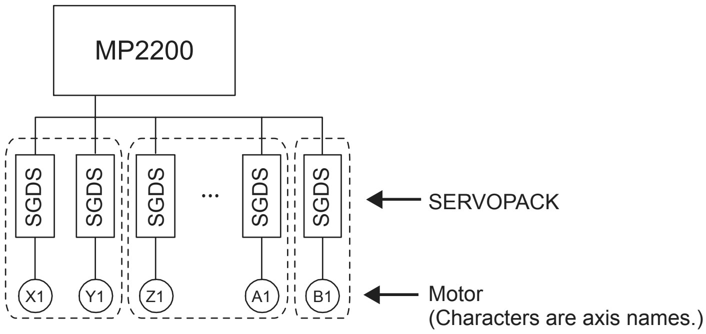
(1) Groups

With the MP2200, the axes can be grouped by operation so that multiple machines can be independently controlled by one Machine Controller. This enables programming to be done for each axis group. The axes to be included in a group are defined in the group definitions. Refer to *MP900/MP2000 Series Programming Device Software MPE720 User's Manual* (Manual No. SIJPC88070005) for information on group definitions.

(a) Operation as One Group



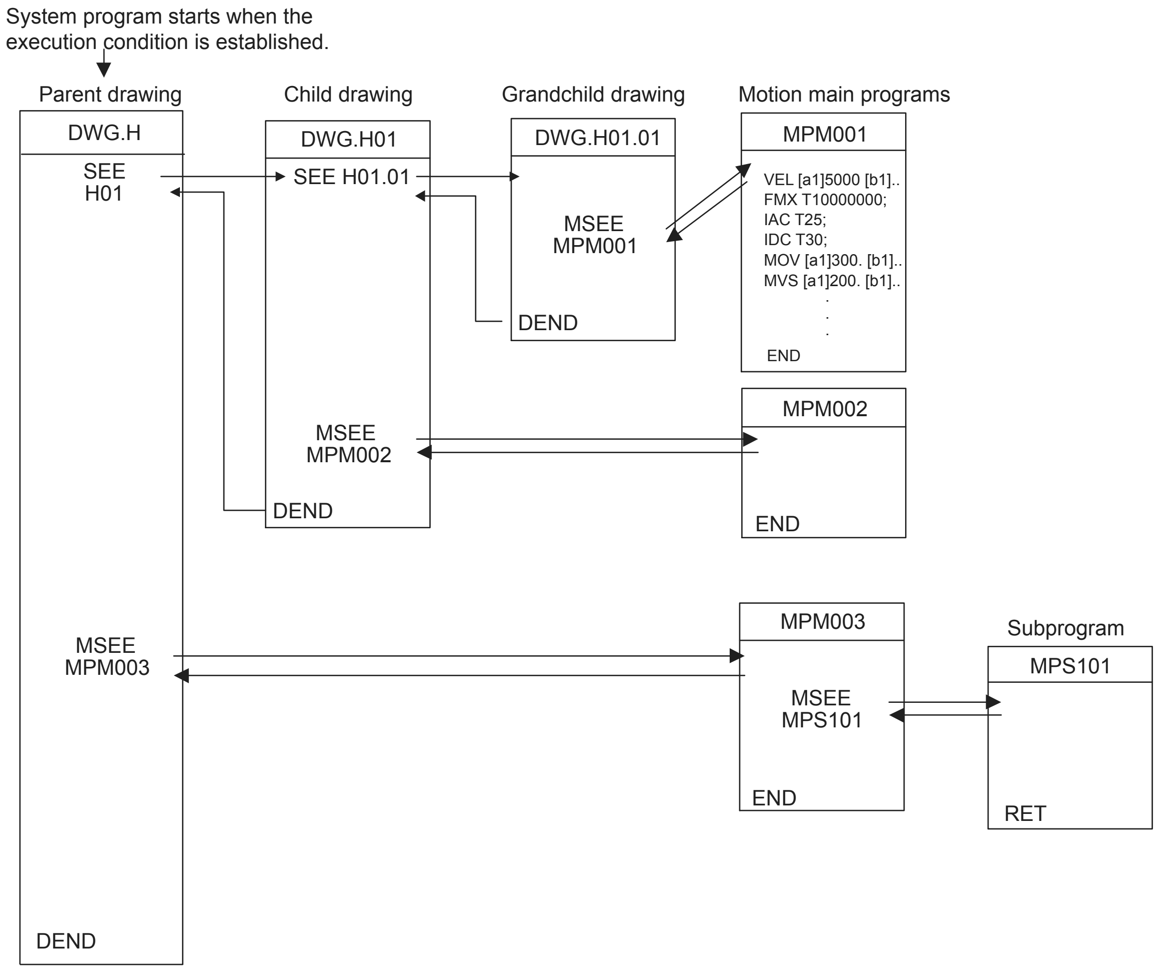
(b) Operation with Multiple Groups



(2) Motion Program Execution Processing Method

A motion program must be called from DWG.H using the MSEE instruction. Motion programs can be called from any DWG.H, i.e., from parent, child, and grandchild DWG.H.

A motion program execution example is shown below.



In each high-speed scanning cycle, the ladder instructions for DWG.H are executed in the following hierarchical order: Parent drawing - child drawing - grandchild drawing.

Motion programs are called in the scanning cycle, but as with ladder programs, all programs cannot necessarily be executed in one scan. Motion programs are executed and controlled by special system motion management functions.

INFO

The following points apply to calling motion programs. Call motion programs with care.

- More than one motion program with the same number cannot be called using the MSEE instruction.
- Subprograms (MPS☐☐☐) cannot be called using the ladder program MSEE instruction. They can be called only from within motion programs (MPM☐☐☐ and MPS☐☐☐).
- The same subprogram cannot be called from two different locations at the same time.

(3) Motion Program Control Signals

To execute a motion program called from a DWG.H by the MSEE instruction, program control signals (such as program start requests and program stop requests) must be input. The second word in the MSEE work registers contains the control signals. The signals used to control motion programs are shown in the following table.

Bit No.	Signal Name	Signal Type
0	Program start request	Differential or NO contact input
1	Program pause request	NO contact
2	Program stop request	NO contact
3	Program single block mode selection	NO contact
4	Program single block start request	Differential or NO contact input
5	Alarm reset request	NO contact
6	Program continuous operation start request	Differential or NO contact input
8	Skip 1 information	NO contact
9	Skip 2 information	NO contact
D	System work number setting*1	NO contact
E	Interpolation override setting*2	NO contact

* 1. System Work Number Setting
OFF: The system work register is automatically defined by the system. The system work number may be different each time.
ON: The system work register set in the fourth word of the MSEE work registers is used.

* 2. Interpolation Override Setting
OFF: Interpolation override fixed at 100%.
ON: Conforms to set interpolation override.

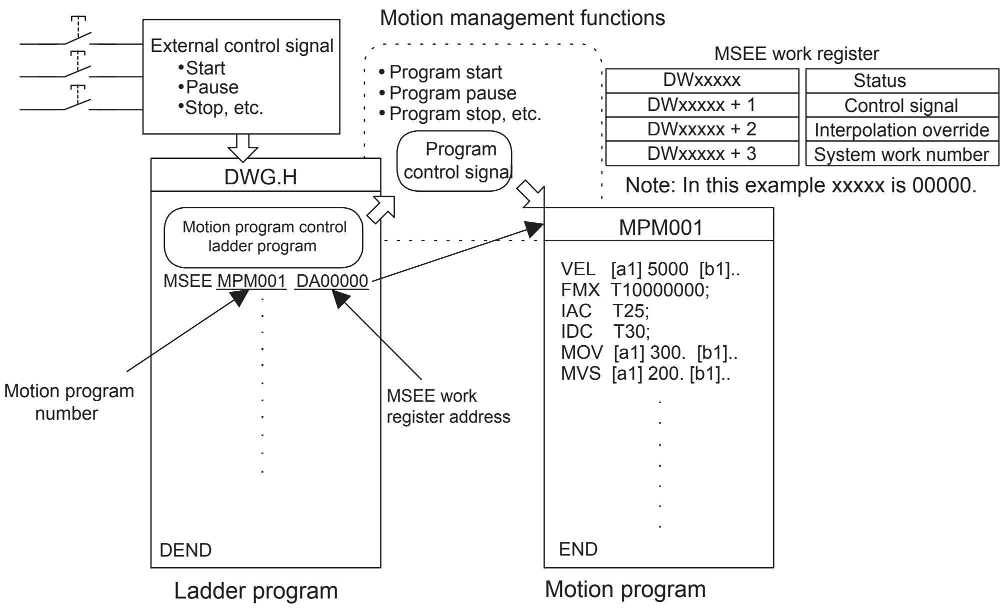
Motion program start, stop, and pause operations can be controlled using the ladder program to input these signals to the work register one higher than the one specified in the MSEE instruction.

For the ladder program inputs, make sure the signals are in accordance with the signal type.

IMPORTANT

The program will be executed if the program start request signal has been turned ON when the power is turned ON. Take appropriate precautions; the equipment may start moving depending on the application.

The following illustration shows the method of executing a motion program.



(4) Motion Program Status

The first word of the MSEE work registers consists of motion program status, which indicate the status of motion program execution. The following table shows the status.

Bit No.	Status
0	Program is running.
1	Program is pausing.
2	Program stopped with program stop request (reserved by the system).
3	(Reserved by the system)
4	Program stopped under single block mode.
8	Program alarm has been generated.
9	Stopped at break point.
B	Debugging mode (EWS debugging)
D	Start request signal history
E	No system work error
F	Main program number limit error

Note: When alarms occur, the details are reflected in the system registers.

(5) Interpolation Override

The override for execution of interpolation commands in the motion program is written to the third word of MSEE work registers.

Unit: 1 = 0.01%

The interpolation override is enabled only if bit E in the motion program control signals (Interpolation Override Setting) is set to ON.

(6) System Work Number

System work numbers used for executing motion programs are set in the fourth word of MSEE work registers.

- Range: 1 to 16

System work numbers are enabled only if bit D in the motion program control signals (System Work Number Setting) is set to ON. If a set work number is out of range, or if the specified work number is being used, bit E in the motion control status (No System Work Error) turns ON.

6

(7) Monitoring Motion Program Execution Information with System Registers

Execution information for motion programs can be monitored using the system registers (SW03200 to SW04191). The monitor method depends on the setting of bit D in the motion program control signals (System Work Number Setting).

(a) Bit D in the Motion Program Control Signals (System Work Number Setting) = ON

Execution information is stored in Work n Program Information, where n is the System Work Number specified in the fourth word of the MSEE registers.

For example, if the System Work Number is 1, motion program execution information can be monitored in SW03264 to SW03321 (Work 1 Program Information).

(b) Bit D in the Motion Program Control Signals (System Work Number Setting) = OFF

The system work number that is used is automatically decided by the system. For this reason, the work number that is being used can be confirmed by referring to the Executing Program Number in SW03200 to SW03215.

For example, if the motion program to be monitored is MPM001, and SW03202 is 001, then the work number being used is 3 and so the execution information of motion program MPM001 can be monitored with Work 3 Program Information in SW03380 to SW03437.

The registers for motion program execution information are shown below.

Motion Program Execution Information

Register	Contents	Size
SW03200	Executing program number (number of main program being executed)	16W
SW03216	Reserved by the system.	16W
SW03232	Executing program bit (executing when corresponding bit = ON)	16W
SW03248	Reserved by the system.	16W
SW03264	Work 1 program information	58W
SW03322	Work 2 program information	58W
SW03380	Work 3 program information	58W
SW03438	Work 4 program information	58W
SW03496	Work 5 program information	58W
SW03554	Work 6 program information	58W
SW03612	Work 7 program information	58W
SW03670	Work 8 program information	58W
SW03728	Work 9 program information	58W
SW03786	Work 10 program information	58W
SW03844	Work 11 program information	58W
SW03902	Work 12 program information	58W
SW03960	Work 13 program information	58W
SW04018	Work 14 program information	58W
SW04076	Work 15 program information	58W
SW04134	Work 16 program information	58W
SW04192	Reserved by the system.	928W
SW05120	Reserved by the system.	64W

Executing Program Numbers

Register	Contents
SW03200	Work 1 program number
SW03201	Work 2 program number
SW03202	Work 3 program number
SW03203	Work 4 program number
SW03204	Work 5 program number
SW03205	Work 6 program number
SW03206	Work 7 program number
SW03207	Work 8 program number
SW03208	Work 9 program number
SW03209	Work 10 program number
SW03210	Work 11 program number
SW03212	Work 12 program number
SW03213	Work 13 program number
SW03214	Work 14 program number
SW03215	Work 15 program number
SW03216	Work 16 program number

Executing Program Bits

Register	Contents
SW03232	MP□016 (Bit 15) to MP□001 (Bit 0)
SW03233	MP□032 (Bit15) to MP□017 (Bit 0)
SW03234	MP□048 (Bit 15) to MP□033 (Bit 0)
SW03235	MP□054 (Bit 15) to MP□049 (Bit 0)
SW03236	MP□080 (Bit 15) to MP□055 (Bit 0)
SW03237	MP□096 (Bit 15) to MP□081 (Bit 0)
SW03238	MP□112 (Bit 15) to MP□097 (Bit 0)
SW03239	MP□128 (Bit 15) to MP□113 (Bit 0)
SW03240	MP□144 (Bit 15) to MP□129 (Bit 0)
SW03241	MP□160 (Bit 15) to MP□145 (Bit 0)
SW03242	MP□176 (Bit 15) to MP□161 (Bit 0)
SW03243	MP□192 (Bit 15) to MP□177 (Bit 0)
SW03244	MP□208 (Bit 15) to MP□193 (Bit 0)
SW03245	MP□224 (Bit 15) to MP□209 (Bit 0)
SW03246	MP□240 (Bit 15) to MP□225 (Bit 0)
SW03247	MP□256 (Bit 15) to MP□241 (Bit 0)

The configuration of Work n Program Information is shown below.

Work n Program Information

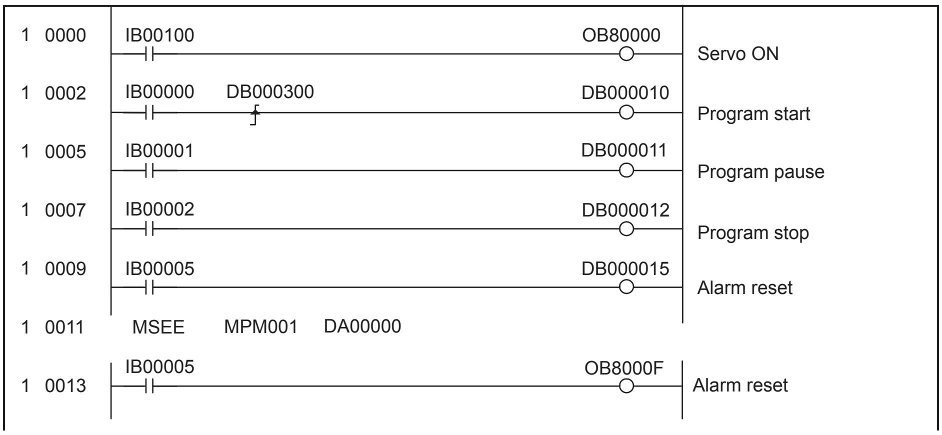
Offset	Item	Size
+0	Program status	
+1	Program control signal	
+2	Parallel 0 information	3W
+5	Parallel 1 information	3W
+8	Parallel 2 information	3W
+11	Parallel 3 information	3W
+14	Parallel 4 information	3W
+17	Parallel 5 information	3W
+20	Parallel 6 information	3W
+23	Parallel 7 information	3W
+26	Current position for logical axis #1 program	2W
+28	Current position for logical axis #2 program	2W
+30	Current position for logical axis #3 program	2W
+32	Current position for logical axis #4 program	2W
+34	Current position for logical axis #5 program	2W
+36	Current position for logical axis #6 program	2W
+38	Current position for logical axis #7 program	2W
+40	Current position for logical axis #8 program	2W
+42	Current position for logical axis #9 program	2W
+44	Current position for logical axis #10 program	2W
+46	Current position for logical axis #11 program	2W
+48	Current position for logical axis #12 program	2W
+50	Current position for logical axis #13 program	2W
+52	Current position for logical axis #14 program	2W
+54	Current position for logical axis #15 program	2W
+56	Current position for logical axis #16 program	2W

Executing program number
Executing block number
Alarm code*

* Refer to *10.1 Motion Errors* in *MP2200/MP2300 Machine Controller Motion Module User's Manual* (Manual No. SIJPC88070016) for information on motion program alarms.

(8) Example of a Ladder Program for Motion Program Control

The minimum ladder program required to control a motion program is shown in the following illustration.



The contents of this ladder program are shown in the following table.

Step No.	Program Content
1	Sets motion setting parameter OB80000 (Servo ON) using external input signal IB00100, and turns ON the servo.
2 to 10	The signals connected to the MP2200 external input signals are stored as the motion program control signals. IW0000 (external input signal) Å® DW00001 (second word of MSEE register) • Program start • Program pause • Program stop • Alarm reset
11, 12	Calls motion program MPM001. MSEE MPM001 DA00000 ① ② ①Motion program number ②MSEE work register address
13, 14	Sets the operating mode and alarm clear (OB0000F) in the setting parameters using the alarm reset signal (IB00005), and clears the alarm.

When the external input signals (IB00000 to IB00005) connected to the MP2200 are input to DW00001 (second word of MSEE work registers) as motion program control signals using the ladder program shown above, motion program operations such as run, stop, and pause can be performed by the system motion management functions.

◀ EXAMPLE ▶

The following table shows an example of external input signals required to create the minimum ladder program for running motion programs on the MP2200.

External Signal Address	External Signal Name
IB00000	Program start
IB00001	Program pause
IB00002	Program stop
IB00005	Alarm reset

Bit No.	Motion Program Control Signal
0	Program start request
1	Program pause request
2	Program stop request
5	Alarm reset request

6.3.4 Functions

Functions are executed by being called from a parent, child, or grandchild drawing using the FSTART instruction. Unlike child and grandchild drawings, functions can be called from any drawing. The same function can also be called simultaneously from drawings of different types and different hierarchies. Moreover, a function that was previously created can also be called from another function.
The following advantages can be obtained by using functions:

- User programs can be easily divided into parts.
- User programs can be easily prepared and maintained.

Functions are divided into standard system functions, which are provided by the system, and user functions, which are defined by the user.

(1) Standard System Functions

The functions given in the following table, which include transfer functions, are provided by the system as standard functions. The user cannot change the standard system functions.

Type	Name	Symbol	Details
System functions	Counters	COUNTER	Up/down counter
	First-in/First-out Stack	FINFOUT	First-in/first-out stack
	Trace Function	TRACE	Data trace execution control
	Data Trace Read	DTRC-RD	Reading data from data trace memory to user memory
	Inverter Trace Read	ITRC-RD	Reading data from inverter trace memory to user memory
	Send Message	MSG-SND	Sending a message to an external communication device
	Receive Message	MSG-RCV	Receiving a message from an external communication device

(2) User Functions

The body of the function (program) and the function definitions can be set by the user. The maximum number of user functions is 500.

For details on MPE720 operating methods and details on instructions, refer to the relevant manuals.

6.4 Registers

This section explains the types of register used by MP2200 user programs (mainly ladder programs) and how these registers are used.

INFO

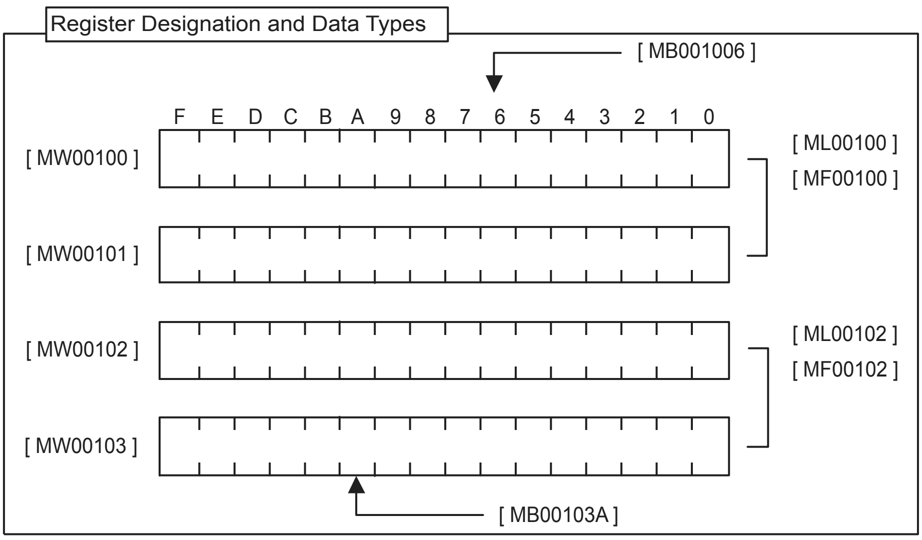
■ Registers

- Registers are memory locations for storing data, and each register consists of 16 bits.
- The data in a register can be a position, speed, or other numeric value, or it can be an ON/OFF signal, i.e., bit information.
- There are three types of numeric values that can be stored.
  - 16-bit integers (–32768 to 32767)
  - 32-bit integers (double-length integers)
  - Real numbers (floating-point numbers)

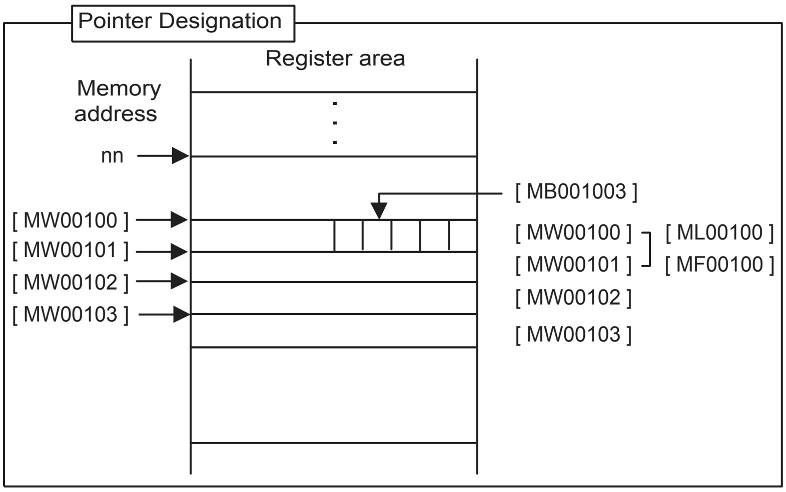
6.4.1 Data Types

There are five data types, each used for different applications: Bit, integer, double-length integer, real number, and address data. Address data is used only for pointer designations inside functions. The following table shows the data types.

Type	Data Type	Numeric Range	Remarks
B	Bit data	ON, OFF	Used in relay circuits.
W	Integer data	–32768 to +32767 (8000H) (7FFFH)	Used in numeric operations. The values in parentheses ( ) are used in logic operations.
L	Double-length integer data	–2147483648 to +2147483647 (80000000H) (7FFFFFFFH)	Used in numeric operations. The values in parentheses ( ) are used in logic operations.
F	Real number data	± (1.175E-38 to 3.402E+38), 0	Used in numeric operations.
A	Address data	0 to 32767	Used only for pointer designations.



Register Designation and Data Types

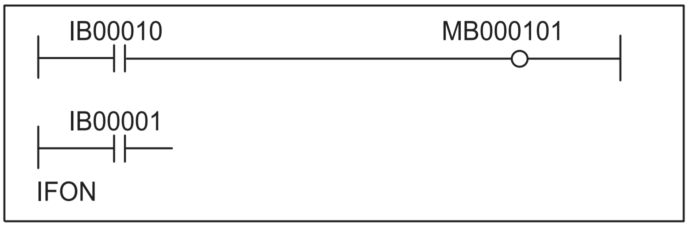


◀ EXAMPLE ▶

- Examples of Use by Data Type

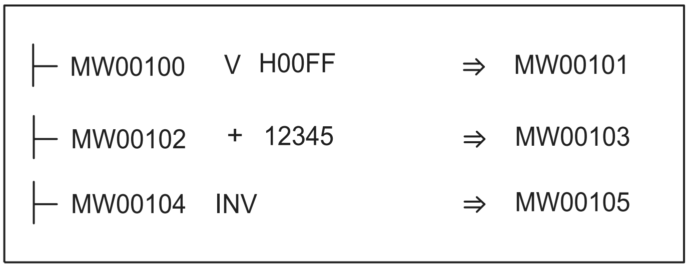
1. Bits

   Bits are used for relay circuit ON/OFF status.



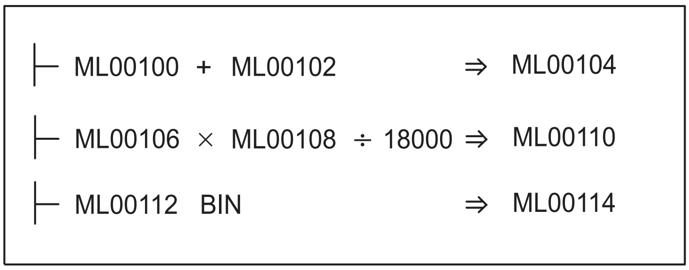
2. Words

   Words are used for numeric operations and logic operations.



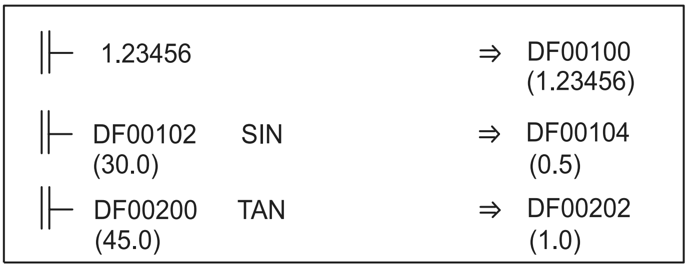
3. Double-length Integers

   Double-length integers are used for numeric operations and logic operations.



4. Real Numbers

   Real numbers are used for floating-point number operations.

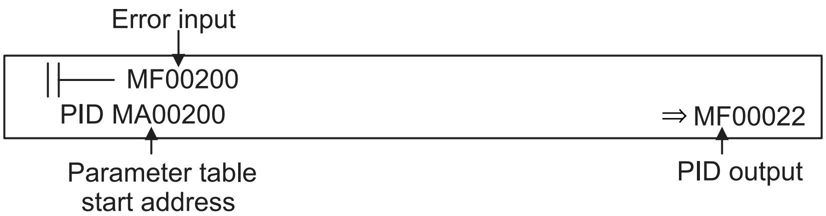


Note: Numbers in parentheses are the data stored in the registers (current value displays).

5. Addresses

   Addresses are used only for pointer designations.

MF00200 to MF00228 Used as a Parameter Table



MW00200 to MW00204 Used as a Parameter Table

6.4.2 Types of Registers

(1) Registers in Drawings

The registers shown in the following table can be used in all drawings.

Type	Name	Designation Type	Range	Description	Characteristic
S	System registers	SB,SW,SL,SFnnnnn (SAnnnnn)	SW00000 to SW08191	System registers are provided by the system. Register number nnnnn is expressed as a decimal number. When the system is started, SW00000 to SW00049 are cleared to 0.	Registers common to all drawings
M	Data registers	MB,MW,ML ,MFnnnnn (MAnnnnn)	MW00000 to MW65534	Data registers are shared by all drawings. Used as interfaces between drawings. Register number nnnnn is expressed as a decimal number.	
I	Input registers	IB,IW,IL,IFhhhh (IAhhhh)	IW0000 to IW7FFF	Registers used for input data. Register number hhhh is expressed as a hexadecimal number.	
O	Output registers	OB,OW,OL,OFhhhh (OAhhhh)	OW0000 to OW7FFF	Registers used for output data. Register number hhhh is expressed as a hexadecimal number.	
C	Constant registers	CB,CW,CL,CFnnnnn (CAnnnnn)	CW00000 to CW16383	Constant registers can be read only in the program. Register number nnnnn is expressed as a decimal number.	
#	# registers	#B,#W,#L,#Fnnnnn (#Annnnn)	#W00000 to #W16383	# registers are read-only. # registers can be read only in the corresponding drawing. The actual range used is specified by the user on the MPE720. Register number nnnnn is expressed as a decimal number.	Registers unique to each drawing
D	D registers	DB,DW,DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each drawing. D registers can be read only in the corresponding drawing. The actual range used is specified by the user on the MPE720. Register number nnnnn is expressed as a decimal number.	

* The ranges of integer data is given as typical examples.

Note: Register number nnnnn is expressed as a decimal number.
Register number hhhh is expressed as a hexadecimal number.

(2) Registers in Functions

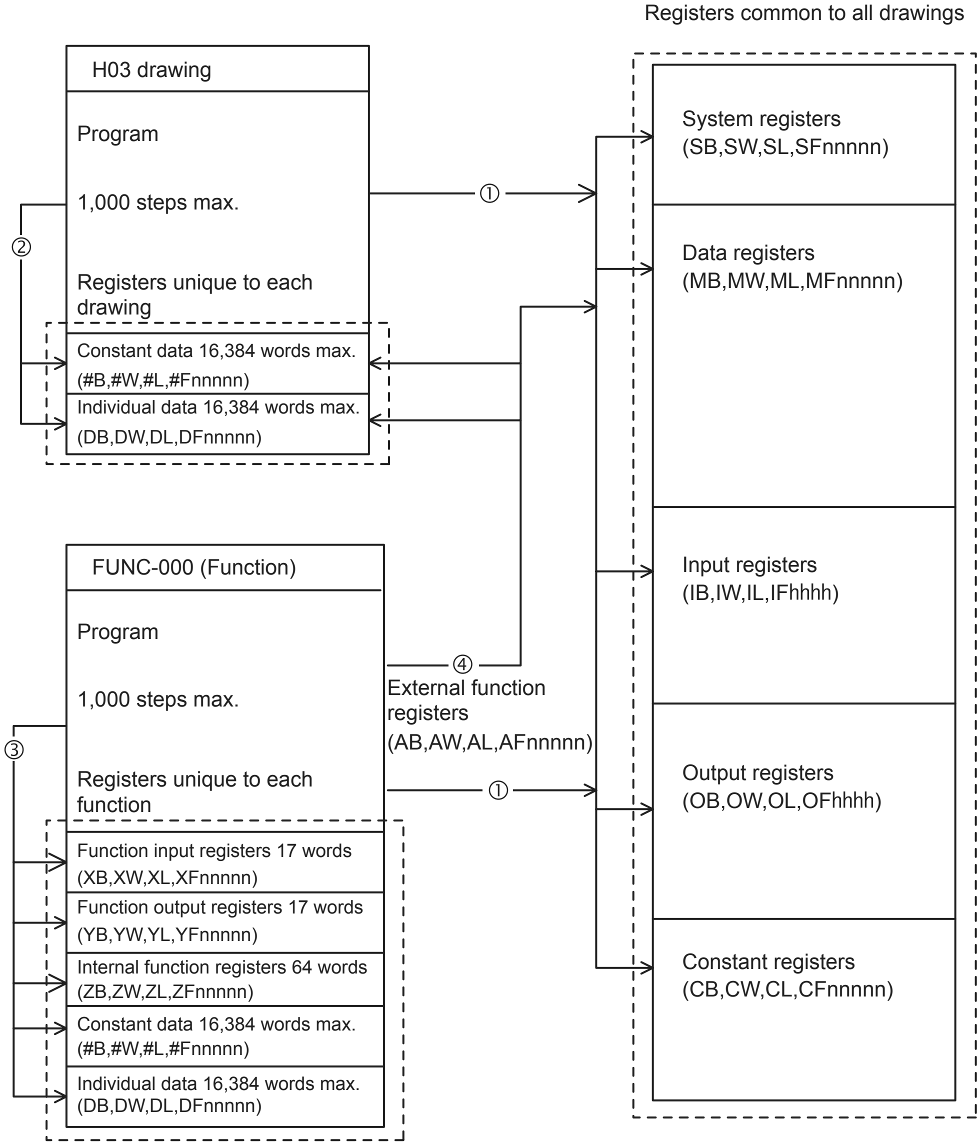
The types of register shown in the following table can be used in functions.

Type	Name	Designation Type	Range	Description	Charac- teristic
X	Function input registers	XB,XW,XL,XFnnnnn	XW00000 to XW00016	Input to a function. Bit input: XB000000 to XB00000F Integer input: XW00001 to XW00016 Double-length integer input: XL00001 to XL00015 Register number nnnnn is expressed as a decimal number.	Registers unique to each function
Y	Function output registers	YB,YW,YL,YFnnnnn	YW00000 to YW00016	Output from a function. Bit output: YB000000 to YB00000F Integer output: YW00001 to YW00016 Double-length integer output: YL00001 to YL00015 Register number nnnnn is expressed as a decimal number.	
Z	Internal function registers	ZB,ZW,ZL,ZFnnnnn	ZW00000 to ZW00063	Internal registers unique to each function. Can be used in the function for internal processes. Register number nnnnn is expressed as a decimal number.	
A	External function registers	AB,AW,AL,AFnnnnn	AW00000 to AW32767	External registers that use the address input value as the base address. For linking with S, M, I, O, #, and DAnnnnn registers. Register number nnnnn is expressed as a decimal number.	
#	# registers	#B,#W,#L,#Fnnnnn (#Annnnn)	#W00000 to #W16383	Registers that can only be read by a function. Can be used only by the corresponding function. The actual range used is specified by the user on the MPE720. Register number nnnnn is expressed as a decimal number.	
D	D registers	DB,DW,DL,DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each function. Can be used only by the corresponding function. The actual range used is specified by the user on the MPE720. Register number nnnnn is expressed as a decimal number.	
S	System registers	SB,SW,SL,SFnnnnn (SAnnnnn)	Same as drawing registers. These registers are common to drawings and functions, so care must be taken with how they are used when calling the same function from drawings with different priority levels.		
M	Data registers	MB,MW,ML, MFnnnnn (MAnnnnn)			
I	Input registers	IB,IW,IL,IFhhhh (IAhhhh)			
O	Output registers	OB,OW,OL,OFhhhh (OAhhhh)			
C	Constant registers	CB,CW,CL,CFnnnnn (CAnnnnn)			

Note: 1. Register number nnnnn is expressed as a decimal number.
Register number hhhh is expressed as a hexadecimal number.
2. SA, MA, IA, OA, DA, #A, and CA can also be used in the program.

(3) Register Ranges in Programs

The programs and register ranges are shown below.

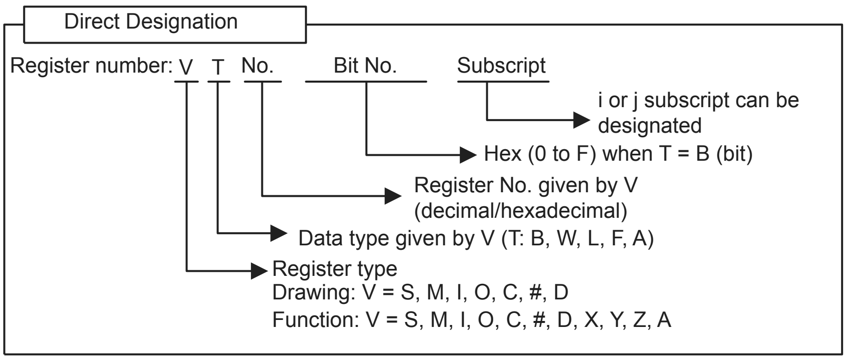


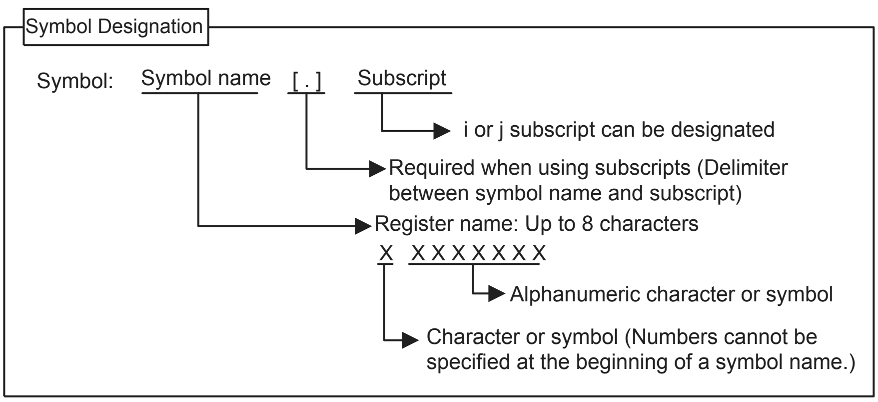
①: Registers common to all drawings can be called from any drawing or function.
②: Registers unique to a drawing can be called only from within that drawing.
③: Registers unique to a function can be called only from within that function.
④: Registers common to all drawings and registers unique to each drawing can be called from functions using external function registers.

6.4.3 Register Designation Methods

Registers can be designated by direct designation of the register number or by symbolic designation. These two types of register designation can be used together in the same ladder program. When symbolic designation is used, the correspondence between the symbols and the register numbers must be defined. The following table shows the register designation methods.

Designation Type	Description
Direct Designation	Register designation by bit: MB00100AX Register designation by integer: MW00100X Register designation by double-length integer: ML00100X Register designation by real number: MF00100X Register designation by address: MA00100X X: For subscripts, add the subscript i or j after the register number.
Symbol Designation	Register designation by bit: RESET1-A.X Register designation by integer: STIME-H.X Register designation by double-length integer: POS-REF.X Register designation by real number: IN-DEF.X Register designation by address: PID-DATA.X Up to 8 characters X: For subscripts, add a period (.) and the subscript i or j after the symbol, which must be 8 characters or less.



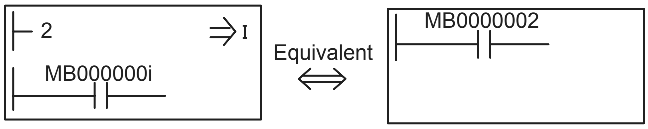


6.4.4 Subscripts i and j

Two subscripts, i and j, are used for modifying relay numbers and register numbers. i and j have exactly the same function. An example of each register data type is explained below.

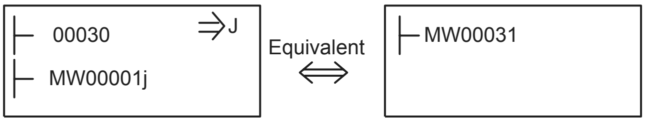
(1) Bit Data with a Subscript

When a subscript is attached to bit data, the value of i or j is added to the relay number. For example, if i = 2, MB000000i will be the same as MB000002. If j = 27, MB000000j will be the same as MB00001B.



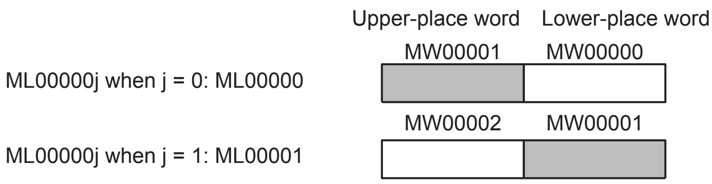
(2) Integer Data with a Subscript

When a subscript is attached to integer data, the value of i or j is added to the register number. For example, if i = 3, MW00010i will be the same as MW00013. If j = 30, MW00001j will be the same as MW00031.



(3) Double-length Integer Data with a Subscript

When a subscript is attached to double-length integer data, the value of i or j is added to the register number. For example, if i = 1, ML00000i will be the same as ML00001. ML00000j when j = 0, and ML00000j when j = 1 will be as follows:



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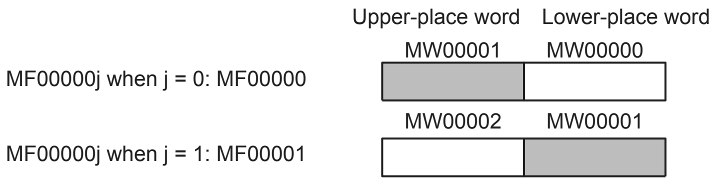
(4) Real Number Data with a Subscript

When a subscript is attached to real number data, the value of i or j is added to the register number. For example, if i = 1, MF00000i will be the same as MF00001. MF00000j when j = 0, and MF00000j when j = 1 will be as follows:



◀ EXAMPLE ▶

■ Programming Example Using a Subscript

The following program sets the sum of 100 registers from MW00100 to MW00199 in MW00200 using subscript j.

```
├  00000                              ⇒ MW00200
FOR  j = 00000 to 00099 by 00001
├  MW00200  +  MW00100j               ⇒ MW00200
FEND
```

Programming Example Using a Subscript

6.5 Self-configuration

6.5.1 Overview of Self-configuration

Self-configuration eliminates the need to make settings for Module definitions, making it possible to perform startup work easily and quickly for the MP2200 system. Optional Modules are recognized and definition files are generated automatically.

Input registers and output registers are automatically allocated to I/O. Allocation is performed in ascending order from the Module with the lowest option slot number.

In networks, such as MECHATROLINK and DeviceNet, information about the station configuration is collected and definition files are generated automatically.

Self-configuration can be executed by either turning the power ON with the CNFG and INIT switches ON, or it can be executed from the MPE720. The procedure for executing self-configuration using the CNFG and INIT switches is given below.

The allocated I/O register numbers will change when self-configuration is executed.

• Executing Self-configuration for the Whole Configuration

CNFG switch = ON
INIT switch = ON

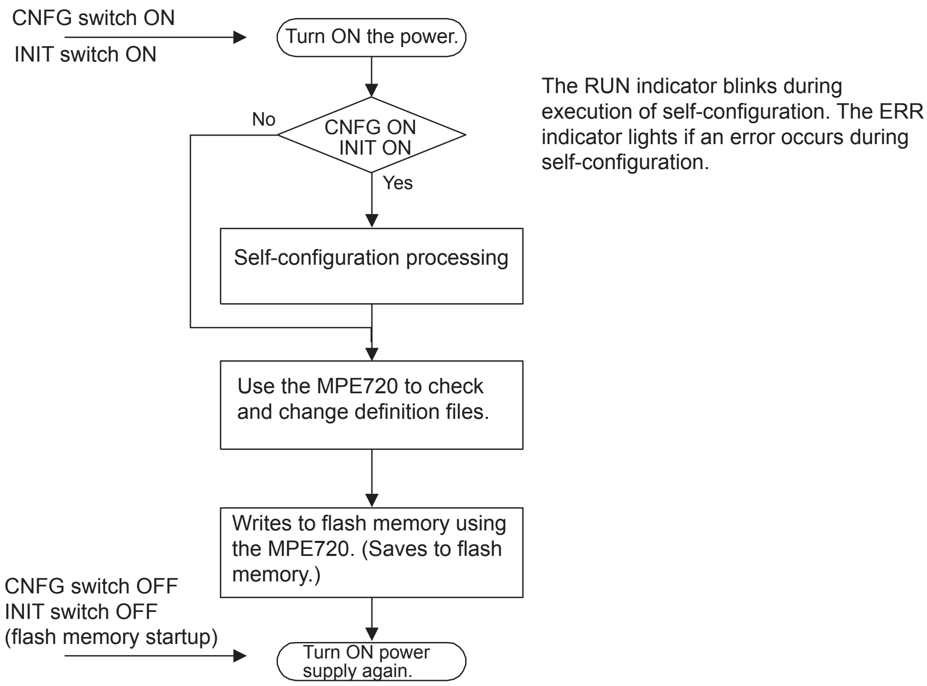
Self-configuration will be executed for all Modules. All definition files will be created (or recreated). The contents of ladder drawings, functions, and registers will all be cleared.

• Executing Self-configuration for Additions and Changes

CNFG switch = ON
INIT switch = OFF

Self-configuration is executed for Optional Modules and network devices that have been added or changed.

Make sure that Modules with existing definition files are connected when self-configuration is executed. Only definition data for Modules that have been added or changed will be overwritten.

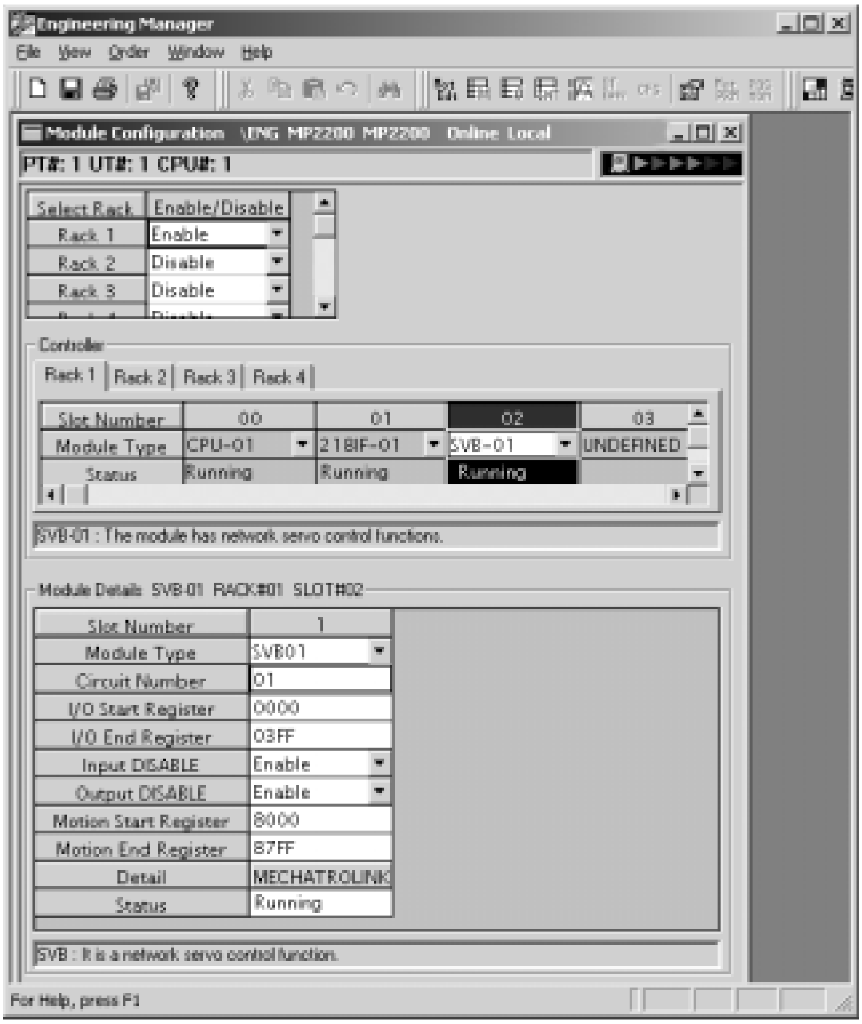


6.5.2 SVB-01 Modules

Details on definition information when self-configuration is executed are shown below.

(1) Module Configuration Definition

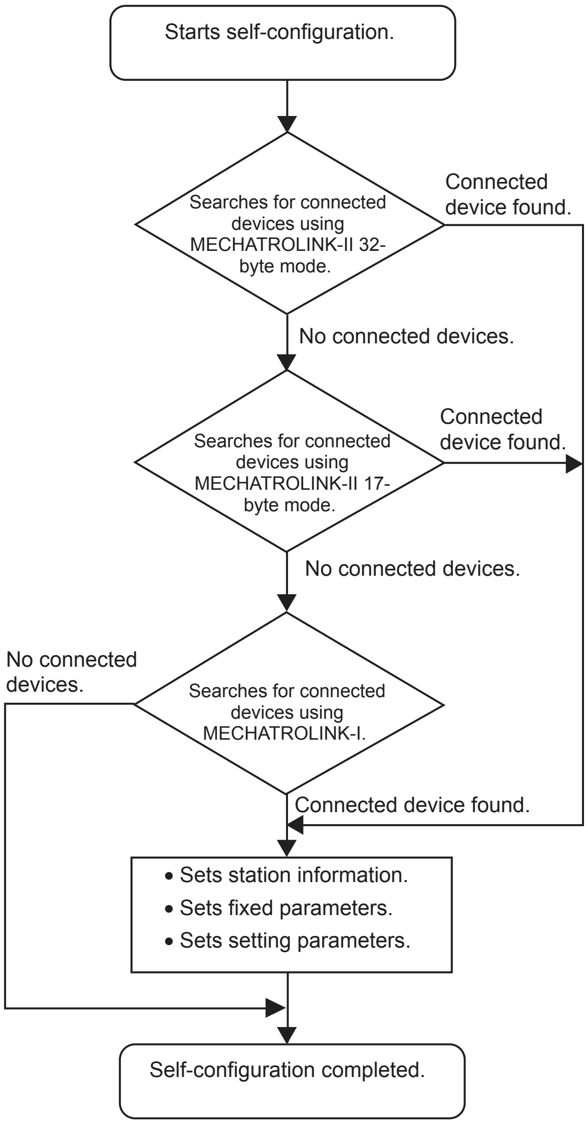
The following illustration shows a Module configuration definition example when SVB-01 and 218IF-01 Modules have been mounted to the MP2200 Option Slot and self-configuration has been executed.



(2) MECHATROLINK Transmission Definitions

MECHATROLINK transmission definitions and slave information is collected in the order shown below when self-configuration is executed.

The communication method is determined when the slave is detected, after which communication method switching and slave detection are not performed. If no Slave stations are detected, communication are connected in MECHATROLINK-I mode.



Note: 1. Detects slaves using each format communication in the following order: SERVOPACK, I/O, inverter.

2. Stations with a communication error or no response due to a duplicated station number or disconnected cable are recognized as having no connected devices.

6

(a) Common Setting Items

Item	Setting Contents	Default Value
Communication method	Sets the communication method. Selections: • MECHATROLINK-I • MECHATROLINK-II (17-byte mode) • MECHATROLINK-II (32-byte mode)	MECHATROLINK-II (32-byte mode)
Master/Slave	Sets the Module to a master or a slave. Selections: • Master • Slave	Master
Own station number (local station number)	The local station address for the master is 0 (fixed). The local station address for a slave is 1 to the number of slaves. The number of slaves can be changed using communication.	0

Note: 1. The hardware switch has priority for the master/slave setting.
Definitions for the MPE720 must match the hardware switch settings.
2. Slaves function as intelligent I/O.

(b) Settings and Display Items by Communication Method

- MECHATROLINK-I

- Master

Item	Details	Default Value
Baud rate	Fixed value; display only.	4 Mbps
Communication cycle	Fixed value; display only.	2 ms
Message reliability level	0, 1, or 2	0
Number of slave stations	Fixed value; display only.	14

- Slaves

Item	Details	Default Value
Baud rate	Fixed value; display only. 4 Mbps	4 Mbps
Communication cycle	Fixed value; display only. 2 ms	2 ms
Message reliability level	Setting not required.	0
Number of slave stations	Fixed value; display only. 15	15

• MECHATROLINK-II (17-byte Mode)

• Master

Item	Details	Default Value
Baud rate	Fixed value; display only.	10 Mbps
No. send bytes	Fixed value; display only.	16 bytes
Communication cycle	0.5 ms or 1 ms	1 ms
SigmaWin	Set whether or not there is a SigmaWin connection. Selections: Yes/No	None
No. of retry stations (messages)	Sets the number of retry stations. Setting range: 0 to 7	1
Number of slave stations	Automatically determined by the SigmaWin setting and the number of retry stations setting. The results is displayed and cannot be changed. Setting range: 0 to 15 The number of slave stations is calculated using the following equation. SigmaWin Yes: 1, No: 0 • Communication cycle: 0.5 ms Number of slave stations = 6 – (No. of retry stations* + SigmaWin) • Communication cycle: 1 ms Number of slave stations = 15 – (No. of retry stations + SigmaWin)	14

* If the communication cycle is 0.5 ms, the maximum number of retry stations is 5.

• Slaves

Item	Details	Default Value
Baud rate	Fixed value; display only. 10 Mbps	10 Mbps
No. send bytes	Fixed value; display only. 16 bytes	16 bytes
Communication cycle	Setting not required.	1 ms
SigmaWin	Setting not required.	None
No. of retry stations (messages)	Setting not required.	1
Number of slave stations	Fixed value; display only. 30	30

6

- MECHATROLINK-II (32-byte Mode)

  - Master

Item	Details	Default Value
Baud rate	Fixed value; display only.	10 Mbps
No. send bytes	Fixed value; display only.	31 bytes
Communication cycle	0.5 ms, 1 ms, 1.5 ms, or 2 ms	1 ms
SigmaWin	Set whether or not there is a SigmaWin connection. Selections: Yes/No	None
No. of retry stations (messages)	Sets the number of retry stations. Setting range: 0 to 7	1
Number of slave stations	Automatically determined by the SigmaWin setting and the number of retry stations setting. The results is displayed and cannot be changed. Setting range: 0 to 15 The number of slave stations is calculated using the following equation. SigmaWin Yes: 1, No: 0 • Communication cycle: 0.5 ms Number of slave stations = 4 – (No. of retry stations* + SigmaWin) • Communication cycle: 1 ms Number of slave stations = 9 – (No. of retry stations + SigmaWin) • Communication cycle: 1 ms Number of slave stations = 15 – (No. of retry stations + SigmaWin) • Communication cycle: 1 ms Number of slave stations = 21 – (No. of retry stations + SigmaWin)	8

* If the communication cycle is 0.5 ms, the maximum number of retry stations is 3.

  - Slaves

Item	Details	Default Value
Baud rate	Fixed value; display only. 10 Mbps	10 Mbps
No. send bytes	Fixed value; display only. 31 bytes	31 bytes
Communication cycle	Setting not required.	1 ms
SigmaWin	Setting not required.	None
No. of retry stations (messages)	Setting not required.	1
Number of slave stations	Fixed value; display only. 30	30

INFO

■ MECHATROLINK Transmission Definitions for SVB Built into the MP2300 CPU

The MECHATROLINK transmission definitions are set automatically according to the detected communication method and number of slaves.

Communication Method	MECHATROLINK-II (32 bytes)		MECHATROLINK-II (17 bytes)		MECHATROLINK-I
Communication Speed	10 Mbps		10 Mbps		4 Mbps
No. of Send Bytes	32		17		17
Communication Cycle	1 ms *	2 ms *	1 ms		2 ms
Max. No. of Slave Stations	*	*	14	15	14
No. of Retry Stations	*	*	1	0	–
SigmaWin	No		No		–

* The communication cycle and number of retry stations when using MECHATROLINK-II (32 byte mode) will change as shown in the following table, depending on the highest station number in the detected slave stations.

Highest Slave Station No.	Communication Cycle (ms)	No. Retry Stations
1 to 8	1	1
9	1	0
10 to 16	2	5
17 to 21	2	Determined by the following equation: 21 − (highest station No.)

■ Devices Unable To Be Recognized in Self-configuration

The following Slave devices (I/O Modules) do not have model codes, and are therefore recognized as wild card I/O (*****I/O). Assign a model code in the MPE720 Module Configuration Screen.

- JEPMC-IO350
- JAMSC-120DAI53330
- JAMSC-120DAI73330
- JAMSC-120DAO83330
- JAMSC-120DRA83030

SERVOPACKs with special specifications or that cannot be automatically configured are recognized as wild card SERVOPACKs (*****SERVO). Allocate these SERVOPACKs in the MPE720 Module Configuration Screen.

6

(3) Motion Parameters

The motion parameters for each axis are set as described below when self-configuration is executed.

Refer to *Chapter 4 Motion Parameters* in *MP2200/MP2300 Machine Controller Motion Module User's Manual* (Manual No. SIEPC88070016) for information on motion parameters.

(a) Motion Fixed Parameters

Motion fixed parameters and SERVOPACK parameters are set automatically, as shown below.

1. SVB-01 Module → SERVOPACK

SVB-01 Module Fixed Parameters No.	Name		SERVOPACK SGD-N, SGDB-N	SGDH+ NS100	SGDH+ NS115	SGDS
29	Motor Type	←	Conforms to the connected Servomotor specifications.			
30	Encoder Type	←				
34	Rated Motor Speed	←				
36	Number of Pulses per Motor Rotation	←				
38	Maximum Number of Absolute Encoder Turns	←		Pn205		

Note: 1. The above processing is not performed if the axis is set.
2. All other parameters are on the default settings.

2. SVB-01 Module → SERVOPACK

SVB-01 Module Fixed Parameters No.	Name		SERVOPACK SGD-N, SGDB-N	SGDH+ NS100	SGDH+ NS115	SGDS
16	Backlash Compensation	→	–		Pn81B	Pn214

Note: 1. The default is written if the axis is not set.
2. The above parameters are written to the SERVOPACK RAM.

(b) Motion Setting Parameters

Motion setting parameters and SERVOPACK parameters are set automatically, as shown below.

1. SVB-01 Module → SERVOPACK

SVB-01 Module Setting Parameters Address	Name		SERVOPACK SGD-N, SGDB-N	SGDH+ NS100	SGDH+ NS115	SGDS
OW□□2E	Position Loop Gain	←	Cn-001A	Pn102		
OW□□2F	Speed Loop Gain	←	Cn-0004	Pn100		
OW□□30	Speed Feed Forward Gain	←	Cn-001D	Pn109		
OW□□32	Position Loop Integration Time Constant	←	–	Pn11F		
OW□□34	Speed Loop Integration Time Constant	←	Cn-0005	Pn101		
OW□□3A	Filter Time Constant	←	Cn-0026	Pn812		

Note: 1. The above processing is not performed if the axis is set.
2. All other parameters are on the default settings.

2. SVB-01 Module → SERVOPACK

<table>
<tr><th colspan="2">SVB-01 Module</th><th rowspan="3"></th><th colspan="4">SERVOPACK</th></tr>
<tr><th colspan="2">Setting Parameters</th><th rowspan="2">SGD-N,
SGDB-N</th><th rowspan="2">SGDH+
NS100</th><th rowspan="2">SGDH+
NS115</th><th rowspan="2">SGDS</th></tr>
<tr><th>Address</th><th>Name</th></tr>
<tr><td>OL□□1E</td><td>Positioning Completed Width</td><td>→</td><td colspan="2">–</td><td>Pn500</td><td>Pn522</td></tr>
<tr><td>OL□□36</td><td>Linear Acceleration Time</td><td>→</td><td>Cn-0020</td><td colspan="3">Pn80B</td></tr>
<tr><td>OL□□38</td><td>Linear Deceleration Time</td><td>→</td><td>–</td><td colspan="3">Pn812</td></tr>
</table>

Note: 1. The default is written if the axis is not set.
2. If the axis is set, the parameters are written only when bit 10 of fixed parameter 1 (User Constants Self-Writing Function) is enabled.
3. The positioning completed width is written only for MECHATROLINK-II (32 byte mode).
4. The above parameters are written to the SERVOPACK RAM.

6

(c) SERVOPACK Parameters

SERVOPACK parameters are set automatically, as shown below.

However, parameters are not written to the SERVOPACK parameter settings saved in the SVB-01 Module.

The MPE720 must be used to save SERVOPACK parameters to the SVB-01 Module. Refer to *3.3.5 SVB Definitions* in *MP2200/MP2300 Machine Controller Motion Module User's Manual* (Manual No. SIEPC88070016) for details.

<table>
<tr><th colspan="2">SVB-01 Module</th><th rowspan="3"></th><th colspan="4">SERVOPACK</th></tr>
<tr><th colspan="2">SERVOPACK Parameters</th><th rowspan="2">SGD-N, SGDB-N</th><th rowspan="2">SGDH+ NS100</th><th rowspan="2">SGDH+ NS115</th><th rowspan="2">SGDS</th></tr>
<tr><th>Name</th><th>Set Value</th></tr>
<tr><td>P-OT Signal Mapping</td><td>Not valid.</td><td>→</td><td>Cn-0001
Bit 2</td><td colspan="3">Pn50A.3</td></tr>
<tr><td>N-OT Signal Mapping</td><td>Not valid.</td><td>→</td><td>Cn-0001
Bit 3</td><td colspan="3">Pn50B.0</td></tr>
<tr><td>Software Limit Function (Positive) in SERVOPACK</td><td>Not valid.</td><td>→</td><td>Cn-0014
Bit 2</td><td colspan="3" rowspan="2">Pn801.0</td></tr>
<tr><td>Software Limit Function (Negative) on SERVOPACK side</td><td>Not valid.</td><td>→</td><td>Cn-0014
Bit 3</td></tr>
<tr><td>Electronic Gear Ratio (Numerator) on SERVOPACK side</td><td>1</td><td>→</td><td>Cn-0024</td><td colspan="2">Pn202</td><td>Pn20E</td></tr>
<tr><td>Electronic Gear Ratio (Denominator) on SERVOPACK side</td><td>1</td><td>→</td><td>Cn-0025</td><td colspan="2">Pn203</td><td>Pn210</td></tr>
<tr><td>Autotuning Application Switch</td><td>Not valid.</td><td>→</td><td>–</td><td colspan="3">Pn110</td></tr>
<tr><td>/DEC Signal Mapping</td><td>CN1-9
Input terminal</td><td>→</td><td>–</td><td colspan="3">Pn511.0</td></tr>
<tr><td>/EXT1 Signal Mapping</td><td>CN1-10
Input terminal</td><td>→</td><td>–</td><td colspan="3">Pn511.1</td></tr>
<tr><td>/EXT2 Signal Mapping</td><td>CN1-11
Input terminal</td><td>→</td><td>–</td><td colspan="3">Pn511.2</td></tr>
<tr><td>/EXT3 Signal Mapping</td><td>CN1-12
Input terminal</td><td>→</td><td>–</td><td colspan="3">Pn511.3</td></tr>
<tr><td>Speed Reference Command Option</td><td>Use T-REF as external torque limit.</td><td>→</td><td>–</td><td colspan="3">Pn002.0</td></tr>
<tr><td>Torque Reference Command Option</td><td>Use V-REF as external speed limit input.</td><td>→</td><td>–</td><td colspan="3">Pn002.1</td></tr>
</table>

Note: 1. The above processing is not performed if the axis is set.
2. The above parameters are written to the SERVOPACK EEPROM.

<table>
<tr><th colspan="2">SVB-01 Module</th><th rowspan="3"></th><th colspan="4">SERVOPACK</th></tr>
<tr><th colspan="2">SERVOPACK Parameters</th><th rowspan="2">SGD-N, SGDB-N</th><th rowspan="2">SGDH+ NS100</th><th rowspan="2">SGDH+ NS115</th><th rowspan="2">SGDS</th></tr>
<tr><th>Name</th><th>Set Value</th></tr>
<tr><td>Excessive Position Error Area</td><td>65535</td><td>→</td><td>Cn-001E</td><td colspan="3">–</td></tr>
<tr><td>Overtravel Level</td><td>32767</td><td>→</td><td>–</td><td colspan="2">Pn505</td><td>–</td></tr>
<tr><td>Excessive Position Error Alarm Detection Level</td><td>$2^{30}-1$</td><td>→</td><td colspan="3">–</td><td>Pn520</td></tr>
<tr><td>Excessive Position Error Warning Detection Level</td><td>100</td><td>→</td><td>–</td><td colspan="3">Pn51E</td></tr>
<tr><td>Area where Negative Latch Is Possible</td><td>Pn820 value</td><td>→</td><td colspan="2">–</td><td colspan="2">Pn822</td></tr>
</table>

Note: The above parameters are written to the SERVOPACK RAM, except for "Area where negative latch possible," which is written to EEPROM.

6.5.3 SVA-01 Modules

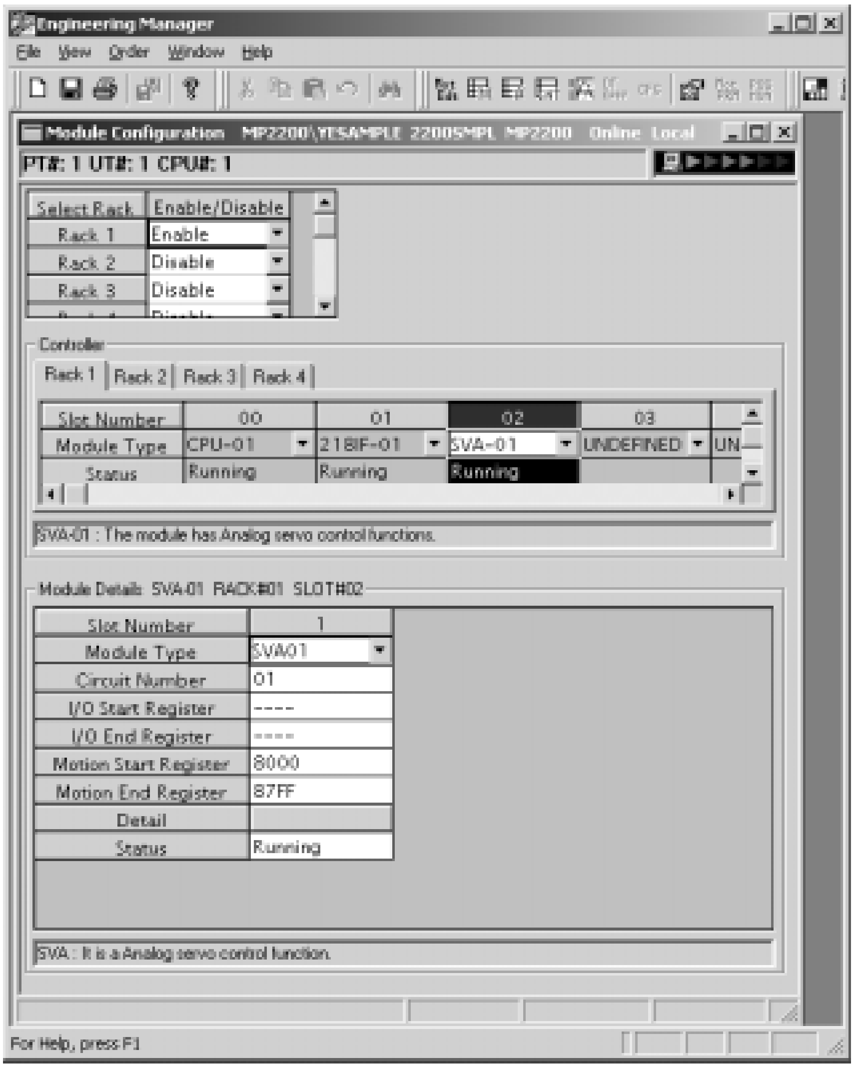
Details on definition information when self-configuration is executed are shown below.

(1) Module Configuration Definition

The following illustration shows a Module configuration definition example when SVA-01 and 218IF-01 Modules have been mounted to the MP2200 Option Slot and self-configuration has been executed.

The line number is automatically set to 01 in the details section for the SVA-01 Module and motion registers are allocated as shown below.

- Motion Leading Register Number: 8000
- Motion Ending Register Number: 87FF



6

6.5.4 LIO-01 Modules

Details on definition information when self-configuration is executed are shown below.

(1) I/O Allocations

Modules mounted in option slots are detected and input registers and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.

With LIO-01 Modules, 48 words are allocated for both input registers and output registers.

Item	Allocations
Digital inputs (16 points)	Out of the 48 words allocated to one Module, the first word is automatically allocated to input registers. Example: If LIO-01 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way: LIO-01 Module mounted in slot 1: IW0410, LIO-01 Module mounted in slot 2: IW0440
Digital output (16 points)	Out of the 48 words allocated to one Module, the second word is automatically allocated to output registers. Example: If LIO-01 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way: LIO-01 Module mounted in slot 1: OW0411, LIO-01 Module mounted in slot 2: OW0441
Counters	Out of the 48 words allocated to one Module, the last 32 words are automatically allocated to the input and output registers. Example: If LIO-01 Modules are mounted in slots 1 and 2, counters will be allocated in the following way: LIO-01 Module mounted in slot 1: IW0420/OW0420, LIO-01 Module mounted in slot 2: IW0450/OW0450

Note: The above allocations are simply an example. The leading register number will change for manual allocations.

(2) Counter Fixed Parameters

When self-configuration is executed, all of the counter fixed parameters will take their default settings. For details on fixed parameters, refer to *4.8.4 Counter Parameters*.

6.5.5 LIO-02 Modules

Details on definition information when self-configuration is executed are shown below.

(1) I/O Allocations

Modules mounted in option slots are detected, and input registers and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.

With LIO-02 Modules, 48 words are allocated to both input registers and output registers.

Item	Allocations
Digital inputs (16 points)	Out of the 48 words allocated to one Module, the first word is automatically allocated to input registers. Example: If LIO-02 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way: LIO-02 Module mounted in slot 1: IW0410, LIO-02 Module mounted in slot 2: IW0440
Digital output (16 points)	Out of the 48 words allocated to one Module, the second word is automatically allocated to output registers. Example: If LIO-02 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way: LIO-02 Module mounted in slot 1: OW0411, LIO-02 Module mounted in slot 2: OW0441
Counters	Out of the 48 words allocated to one Module, the last 32 words are automatically allocated to the input and output registers. Example: If LIO-02 Modules are mounted in slots 1 and 2, counters will be allocated in the following way: LIO-02 Module mounted in slot 1: IW0420/OW0420, LIO-02 Module mounted in slot 2: IW0450/OW0450

Note: The above allocations are simply an example. The leading register number will change for manual allocations.

(2) Counter Fixed Parameters

When self-configuration is executed, all of the counter fixed parameters will take their default settings. For details on fixed parameters, refer to *4.8.4 Counter Parameters*.

6.5.6 LIO-04 Modules

Details on definition information when self-configuration is executed are shown below.

(1) I/O Allocations

Modules mounted in option slots are detected and input registers and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.

With LIO-04 Modules, 2 words are allocated to both input registers and output registers.

Item	Allocations
Digital inputs (16 points)	Out of the 2 words allocated to one Module, the first word is automatically allocated to input registers. Example: If LIO-04 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way: LIO-04 Module mounted in slot 1: IW0410 and IW0411 LIO-04 Module mounted in slot 2: IW0420 and IW0421
Digital output (16 points)	Two words per Module are automatically allocated to output registers. Example: If LIO-04 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way: LIO-04 Module mounted in slot 1: OW0410 and OW0411 LIO-04 Module mounted in slot 2: OW0420 and OW0421

Note: The above allocations are simply an example. The leading register number will change for manual allocations.

6.5.7 218IF-01 Modules

(1) Ethernet Interface

When self-configuration is executed, the following parameter settings will be made for the Ethernet interface of 218IF-01 Modules.

Item	Allocations
Local IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Gateway IP Address	0.0.0.0
System Port (Engineering Port)	10000 (UDP)
TCP Zero Window Timer Value	3 s
TCP Resend Timer Value	500 ms
TCP End Timer Value	60 s
IP Build Timer	30 s
Max. Packet Length	1500 bytes

INFO

An engineering communication connection with the MPE720 is possible using self-configuration. To perform MEMOBUS message communication, the MSG-SND (MSG-RCV) function is required.

(2) RS-232C Interface

When self-configuration is executed, the following parameter settings will be made for the RS-232C interface of 218IF-01 Modules.

Item	Allocations		
Communication Protocol	MEMOBUS		
Master/Slave	Slave		
Device Address	1		
Serial Interface	RS-232C		
Communication Mode	RTU		
Data Length	8 Bit		
Parity	EVEN		
Stop Bits	1 Stop		
Baud Rate	19.2 kbps		
Transmission Delay	Disable		
Automatic Reception	Enable		
Interface Register Settings at the Slave		Leading Register	No. of Words
	Reading input relays	IW0000	5120
	Reading input registers	IW0000	5120
	Reading/writing coils	MW00000	32768
	Reading/writing holding registers	MW00000	32768
	Writing range for coil holding registers	MW00000 LO MW00000 HI MW32767	

INFO

An engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

6.5.8 217IF-01 Modules

(1) RS-422/485 Interface

When self-configuration is executed, the following parameter settings will be made for the RS-422/485 interface of 217IF-01 Modules.

Item	Allocations
Communication Protocol	MEMOBUS
Master/Slave	Slave
Device Address	1
Serial Interface	RS-485
Communication Mode	RTU
Data Length	8 Bit
Parity	EVEN
Stop Bits	1 Stop
Baud Rate	19.2 kbps
Transmission Delay	Disable
Automatic Reception	Enable
Interface Register Settings at the Slave	Leading Register / No. of Words Reading input relays: IW0000, 5120 Reading input registers: IW0000, 5120 Reading/writing coils: MW00000, 32768 Reading/writing holding registers: MW00000, 32768 Writing range for coil holding registers: MW00000 LO MW00000 HI MW32767

INFO

Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function when self-configuration is executed.

(2) RS-232C Interface

When self-configuration is executed, the following parameter settings will be made for the RS-232C interface of 217IF-01 Modules.

Item	Allocations		
Communication Protocol	MEMOBUS		
Master/Slave	Slave		
Device Address	1		
Serial Interface	RS-232C		
Communication Mode	RTU		
Data Length	8 Bit		
Parity	EVEN		
Stop Bits	1 Stop		
Baud Rate	19.2 kbps		
Transmission Delay	Disable		
Automatic Reception	Enable		
Interface Register Settings at the Slave		Leading Register	No. of Words
	Reading input relays	IW0000	5120
	Reading input registers	IW0000	5120
	Reading/writing coils	MW00000	32768
	Reading/writing holding registers	MW00000	32768
	Writing range for coil holding registers	MW00000 LO MW00000 HI MW32767	

INFO

An engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

6

6.5.9 260IF-01 Modules

(1) DeviceNet communication

When self-configuration is executed, the following parameter settings will be made for the DeviceNet interface of 260IF-01 Modules.

Item	Allocations
Master/Slave Specification	Depends on switch settings.
MAC ID	Depends on switch settings.
Communication Cycle Time	Master: 300 ms Slave: 0 ms
I/O Allocations	Depend on switch settings.
I/O Leading Register Number	Depends on switch settings.
I/O End Register Number	Depends on switch settings.

(2) RS-232C Interface

When self-configuration is executed, the following parameter settings will be made for the RS-232C interface of 260IF-01 Modules.

<table>
<tr><th>Item</th><th colspan="3">Allocations</th></tr>
<tr><td>Communication Protocol</td><td colspan="3">MEMOBUS</td></tr>
<tr><td>Master/Slave</td><td colspan="3">Slave</td></tr>
<tr><td>Device Address</td><td colspan="3">1</td></tr>
<tr><td>Serial Interface</td><td colspan="3">RS-232C</td></tr>
<tr><td>Communication Mode</td><td colspan="3">RTU</td></tr>
<tr><td>Data Length</td><td colspan="3">8 Bit</td></tr>
<tr><td>Parity</td><td colspan="3">EVEN</td></tr>
<tr><td>Stop Bits</td><td colspan="3">1 Stop</td></tr>
<tr><td>Baud Rate</td><td colspan="3">19.2 kbps</td></tr>
<tr><td>Transmission Delay</td><td colspan="3">Disable</td></tr>
<tr><td>Automatic Reception</td><td colspan="3">Enable</td></tr>
<tr><td rowspan="6">Interface Register Settings at the Slave</td><td></td><td>Leading Register</td><td>No. of Words</td></tr>
<tr><td>Reading input relays</td><td>IW0000</td><td>5120</td></tr>
<tr><td>Reading input registers</td><td>IW0000</td><td>5120</td></tr>
<tr><td>Reading/writing coils</td><td>MW00000</td><td>32768</td></tr>
<tr><td>Reading/writing holding registers</td><td>MW00000</td><td>32768</td></tr>
<tr><td>Writing range for coil holding registers</td><td>MW00000
LO MW00000
HI MW32767</td><td></td></tr>
</table>

INFO

An engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

6.5.10 261IF-01 Modules

(1) PROFIBUS Interface

When self-configuration is executed, the following parameter settings will be made for the PROFIBUS interface of 261IF-01 Modules.

Item	Allocations
SYNC-SCAN	Low
Own Station Number (Local Station Number)	Depends on switch settings.
I/O Allocations	Depend on switch settings.
Communication Speed	Automatically detected from the masters transmission data.
I/O Leading Register Number	Depends on switch settings.
I/O End Register Number	Depends on switch settings.

(2) RS-232C Interface

When self-configuration is executed, the following parameter settings will be made for the RS-232C interface of 261IF-01 Modules.

<table>
<tr><th>Item</th><th colspan="3">Allocations</th></tr>
<tr><td>Communication Protocols</td><td colspan="3">MEMOBUS</td></tr>
<tr><td>Master/Slave</td><td colspan="3">Slave</td></tr>
<tr><td>Device Address</td><td colspan="3">1</td></tr>
<tr><td>Serial Interface</td><td colspan="3">RS-232C</td></tr>
<tr><td>Communication Mode</td><td colspan="3">RTU</td></tr>
<tr><td>Data Length</td><td colspan="3">8 Bit</td></tr>
<tr><td>Parity</td><td colspan="3">EVEN</td></tr>
<tr><td>Stop Bits</td><td colspan="3">1 Stop</td></tr>
<tr><td>Baud Rate</td><td colspan="3">19.2 kbps</td></tr>
<tr><td>Transmission Delay</td><td colspan="3">Disable</td></tr>
<tr><td>Automatic Reception</td><td colspan="3">Enable</td></tr>
<tr><td rowspan="6">Interface Register Settings at the Slave</td><td></td><td>Leading Register</td><td>No. of Words</td></tr>
<tr><td>Reading input relays</td><td>IW0000</td><td>5120</td></tr>
<tr><td>Reading input registers</td><td>IW0000</td><td>5120</td></tr>
<tr><td>Reading/writing coils</td><td>MW00000</td><td>32768</td></tr>
<tr><td>Reading/writing holding registers</td><td>MW00000</td><td>32768</td></tr>
<tr><td>Writing range for coil holding registers</td><td>MW00000
LO MW00000
HI MW32767</td><td></td></tr>
</table>

INFO

An engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

6.6 Setting and Changing User-defined Files or Data

This section explains precautions when changing the scan times, Module configuration definition, or other settings.

- Scan times: The cycles used to refresh all I/O, execute the ladder programs, etc.
- Module configuration definition: Settings for the Modules comprising the MP2200 and functions

6.6.1 Saving User-defined Files or Data

User-defined files and data must be saved in flash memory. Whenever setting or changing user-defined files, use the MPE720 to save them to flash memory. If the files or data is not saved, the settings and changes will be lost the next time the power supply to the MP2200 is turned OFF.

6.6.2 Setting and Changing the Scan Times

Observe the following precautions when setting and changing the scan times.

- When setting the high-speed and low-speed scans, set them so that they are larger than the maximum execution times. Use the following equation as a guideline:
  (Scan setting − Max. execution time) ≥ (0.2 × Scan setting) ... (20% or more of the setting)

IMPORTANT

- If a scan setting is close to the maximum execution time, refreshing the displays on the MPE720 will be extremely slow and communication timeouts will occur. If the maximum execution time exceeds the scan setting, a watchdog time out error will occur and the MP2200 system will stop.
- Set the high-speed and low-speed scans to integral multiples of the MECHATROLINK communication cycle of the SVB-01 Module. If you change the MECHATROLINK communication cycle, be sure to check the scan time settings.

INFO

- High-speed and Low-speed Scan Setting Example for the SVB-01 Module
  - Set the high-speed and low-speed scans to integral multiples of the MECHATROLINK communication cycle.
  - If you change the MECHATROLINK communication cycle, be sure to check the scan time settings.
  - Setting Example (The calculations are the same for low-speed scans.)
    - For communication cycle = 1 ms (possible only when MECHATROLINK-II is used)
      and max. execution time is ≤ 0.8 ms
      High-speed scan setting ≥ (1.25 × 0.8) = 1 ms
      High-speed scan setting = 1 ms, 2 ms, 3 ms, etc. (an integral multiple of 1 ms or higher)
    - For communication cycle = 1 ms (possible only when MECHATROLINK-II is used)
      and max. execution time is ≤ 1.4 ms
      High-speed scan setting ≥ (1.25 × 1.4) = 1.75 ms
      High-speed scan setting = 2 ms, 3 ms, etc. (an integral multiple of 2 ms or higher)
    - For communication cycle = 2 ms (when MECHATROLINK-I or MECHATROLINK-II is used)
      and max. execution time is ≤ 0.8 ms
      High-speed scan setting ≥ (1.25 × 0.8) = 1 ms
      High-speed scan setting = 1 ms, 2 ms, 4 ms, etc. (1 ms and 2 ms or an integral multiple of 2 ms or higher)
    - For communication cycle = 2 ms (when MECHATROLINK-I or MECHATROLINK-II is used)
      and max. execution time is ≤ 1.4 ms
      High-speed scan setting ≥ (1.25 × 1.4) = 1.75 ms
      High-speed scan setting = 2 ms, 4 ms, etc. (an integral multiple of 2 ms)

- Never change the scan time settings when the Servo is ON, particularly when an axis is moving (i.e., when the motor is running). Doing so may cause errors in motor rotation operations, such as high-speed rotation.
- Always save any data that has been set or changed to flash memory.

6.6.3 Setting and Changing the Module Configuration Definition

Observe the following precautions when setting and changing the Module configuration definition.

- Always confirm that the mounted Modules is the same as with the defined Module.
- Always save any data that has been set or changed to flash memory.
- Once the settings or changes have been made, cycle the MP2200 power supply.

7

Maintenance and Inspection

This chapter explains daily and regular inspection items to ensure that the MP2200 can always be used in its best condition.

7.1 Inspection Items

This section summarizes daily and regular inspection items that must be performed by the customer.

7.1.1 Daily Inspections

The following table lists the daily inspection items.

Inspection Item		Inspection Details	Criteria	Remedy
Installation conditions of Module, etc.		Check that the mounting screws are not loose and that the cover has not come off.	The Module must be secured properly.	Retighten screws.
Connection conditions		Check for terminal screw looseness.	The screws must not be loose.	Retighten terminal screws.
		Check the connectors for looseness.	The connectors must not be loose.	Retighten the connector set screws.
		Check the gap between crimp terminals.	There must be an appropriate gap between the terminals.	Correct.
Indicators	POWER	Check whether the indicator is lit.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	–
	RDY	Check whether the indicator is lit.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	See *Chapter 8 Troubleshooting*.
	RUN	Check whether the indicator is lit while the system is in RUN state.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	See *Chapter 8 Troubleshooting*.
	ERR	Check that the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	See *Chapter 8 Troubleshooting*.
	ALM	Check that the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	See *Chapter 8 Troubleshooting*.
	TX	Check whether the indicator lights during communication.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	See *Chapter 8 Troubleshooting*.
	BAT	Check that the indicator is not lit.	The indicator must be not lit. (The battery voltage is too low if the indicator is lit.)	Replacing the Battery

7.1.2 Regular Inspections

This section explains inspection items that must be performed once or twice every six months to one year. Inspections must also be performed when the equipment is relocated or modified, or when the wiring is changed.

PROHIBITED

- Do not replace the built-in fuse.
  If the customer replaces the built-in fuse, the MP2200 may malfunction or break down.
  Contact your Yaskawa representative.

Inspection Item		Inspection Details	Criteria	Remedy
Operating Environment	Ambient temperature	Check the temperature and humidity with a thermometer and hygrometer, respectively. Check for corrosive gases.	0 to 55 °C	If the MP2200 is used inside a panel, treat the temperature inside the panel as the ambient temperature.
	Ambient humidity		30% to 95 %	
	Atmosphere		There must be no corrosive gases.	
Power supply voltage check	MBU-01 Unit	Measure the voltage between 100/200-VAC terminals.	85 to 276 VAC	Change the power supply as necessary.
	MBU-02 Unit	Measure the voltage between 24-VDC terminals.	19.2 to 28.8 VDC	
Installation Conditions	Loose, excessive play	Attempt to move the Module.	The Module must be secured properly.	Retighten screws.
	Dust and other foreign matter	Visually check.	The Module must be free from dust and other foreign matter.	Clean.
Connection Conditions	Check for terminal screw looseness.	Check by retightening the screws.	The screws must not be loose.	Retighten.
	Gap between crimp terminals	Visually check.	There must be an appropriate gap between the terminals.	Correct.
	Check for connector looseness.	Visually check.	The screws must not be loose.	Retighten the connector set screws.
Battery		Check the BAT indicator on the front panel of the CPU Module.	The BAT indicator must be not lit.	If the BAT indicator is lit, replace the battery.

7.2 MBU-01/MBU-02 Unit Batteries

MBU-01 and MBU-02 Units have a built-in, replaceable battery. This battery is used to back up data to prevent the data stored in the CPU-01 and CPU-02 Modules memories from being lost when power is interrupted (e.g., when the power supply to the MBU-01 or MBU-02 Unit is turned OFF).

7.2.1 Battery Life

The built-in battery can store the memory until the total time of power interruptions reaches one year. The warranty period of the battery is five years from the date of purchase. These values, however, will vary depending on the operating conditions, including ambient temperature.

Always replace the battery with a replacement battery (JZSP-BA01) within two weeks after the CPU-01 or CPU-02 Module BAT indicators first light. Any delay in battery replacement will result in the data stored in the memory being lost.

7.2.2 Replacing the Battery

⚠ CAUTION
• Do not touch the battery electrodes. There is a risk of damage caused by static electricity.

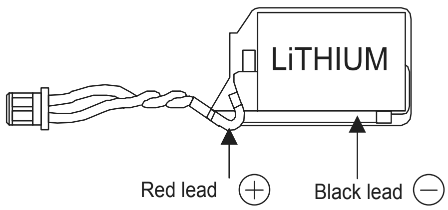
(1) Replacement Preparation

(a) Saving the Memory Contents

Before replacing the battery, copy and save the programs and data from the memory of the CPU-01 or CPU-02 Module to floppy disks or a hard disk. The saved programs and data will be used as back-up if anything is accidentally deleted during battery replacement.

(b) Preparing a Replacement Battery

Prepare a replacement battery (JZSP-BA01). This battery is not commercially available, and must be ordered from your nearest Yaskawa sales representative. The battery is illustrated below.

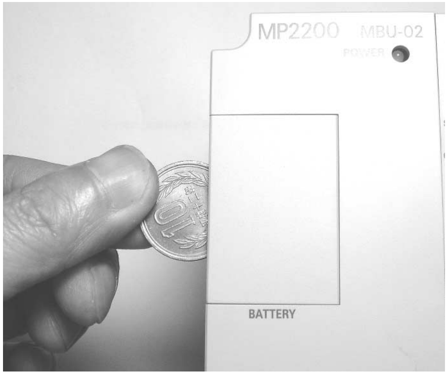


JZSP-BA01 (Battery with Cable)

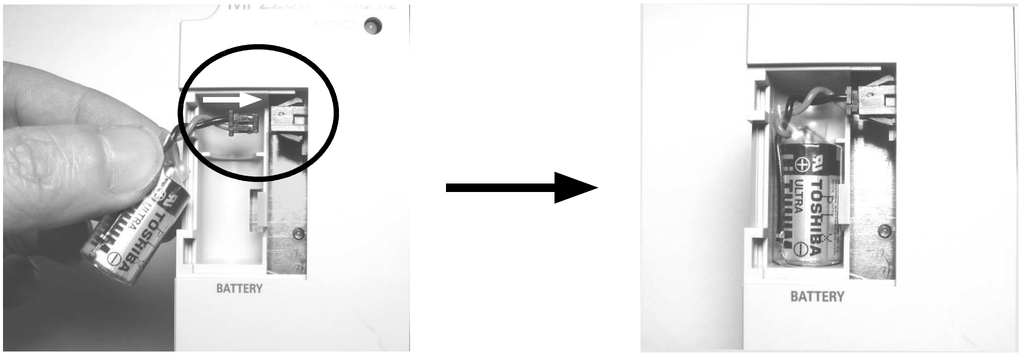
(2) Replacement

Use the following procedure to replace the battery.

1. Confirm that the MBU-01/MBU-02 Unit POWER indicator is lit.
2. Insert a coin or other flat object into the notch on the side of the battery's cover on the base unit. Pry open and remove the cover.



3. Disconnect the battery cable from the connector on the MBU-01/MBU-02 Unit, then remove the built-in battery from the battery holder.
4. Firmly connect the replacement battery cable to the connector on the MBU-01/MBU-02 Unit. Then, place the replacement battery into the battery holder.



5. Make sure that the BAT indicator on the CPU-01 or CPU-02 Module is not lit.
6. Reattach the cover.

This completes the battery replacement procedure.

IMPORTANT

Be sure to replace the battery while the power supply to the MBU-01/MBU-02 Unit turned ON.

Replacing the battery with the power supply to the MBU-01/MBU-02 Unit turned OFF will result in the programs and data stored in the CPU-01 or CPU-02 Module memory being lost.

8

Troubleshooting

This chapter describes the errors that can occur when using the MP2200 system, their probable causes and the appropriate countermeasures.

8

8.1 Overview of Troubleshooting

This section shows the basic troubleshooting flow and provides a list of errors.

8.1.1 Troubleshooting Methods

There are three checks available for checking the system when an errors occurs. They are checks by symptoms, error codes, and monitor functions of peripheral devices. Checking procedures are categorized by status conditions to help determine the cause quickly.

(1) Checking by Symptoms

Factors like indicators on the front of the Module and the control status of all devices are visually checked to determine a cause and implement corrections.

(2) Checking by Error Codes

Error codes generated when errors occur are monitored to determine a cause and implement corrections.

Errors are classified as follows:

Classification	Type of Error Code
Sequence Control Error Code	System (S) registers: SW00040 onwards
Motion Control Error Code	Error in SERVOPACK

(3) Checking by Monitor Functions of Peripheral Devices

The monitor functions of peripheral devices are used to determine the control status and to find the cause of errors. The status of the following functions can be checked.

- Program monitoring
- Position monitoring
- Error monitoring
- Tracing

8.1.2 Basic Troubleshooting Flow

When a problem occurs, it is important to determine the cause and treat the problem fast to get the system up and running as quickly as possible. The following table shows the basic troubleshooting flow.

Point	Basic Details Examined
Visual Check	• Equipment operation (status while stopped) • Power ON/OFF • I/O equipment status • Wiring status • Status of indicators (indicators on all Modules) • Status of all switches (DIP switches and other switches) • Parameters and program content check
Error Check	Observe whether the following alters the error in any way. • Stopping the MP2200. • Resetting the alarm. • Turning the power OFF and ON.
Narrowing the Range	Consider possible failure locations based on the results of 1 and 2 above. • Is the problem in the MP2200 or external? • Is the problem in sequence control or motion control? • Is the problem software or hardware?

8.1.3 Indicator Errors

Error details can be checked by the status of indicators on the front of the MP2200 Module.

In the process, we narrow down the repair location in a program by getting an overview of the error from indicators, checking the contents of the system (S) registers, examining the drawing or function number that caused the error and then getting an overview of operation error details.

(1) Indicators

The LED indicators that display the operating status and error details for the MP2200 are detailed in the following table.

Indicators	Indicator Name	Indicator Color	Significance when Lit
RDY ○ ○ RUN ERR ○ ○ ALM ○ BAT	RDY	Green	Unit operating normally.
	RUN	Green	User program running.
	ALM	Red	Lights/blinks for warning.
	ERR	Red	Lights/blinks for errors.
	BAT	Red	Battery alarm activated.

(2) Indicator Details

The following table describes details for indicators showing operating status and errors in the MP2200, and remedies for those errors.

Classification	Indicator Name					Indicator Details	Remedy
	RDY	RUN	ALM	ERR	BAT		
Normal	Not lit	Not lit	Lit	Lit	Not lit	Resetting hardware Status	Normally the CPU activates within 10 seconds from power ON. If this status continues for longer than this, the problem is a user program error or hardware failure. Troubleshoot system errors.
	Not lit	Not lit	Not lit	Not lit	Not lit	Initializing	
	Not lit	Lit	Not lit	Not lit	Not lit	Drawing A executing	
	Lit	Not lit	Not lit	Not lit	Not lit	User program stopped (Offline Stop Mode)	This status will occur for either of the following. • The program was stopped from the MPE720. • The RUN switch was turned OFF.
	Lit	Lit	Not lit	Not lit	Not lit	User program executing normally	This status will occur during normal operation.
Error	Not lit	Not lit	Not lit	Lit	Not lit	Serious failure	Refer to *8.2.3 Processing Flow for a User Program Error*.
	Not lit	Not lit	Not lit	Blinking	Not lit	Number of blinks for software error: 3: Address error (read) 4: Address error (write) 5: FPU error 6: Illegal general command 7: Illegal slot command 8: General FPU inhibited error 9: Slot FPU inhibited error 10: TLB serious error bit 11: LTB mistake (read) 12: LTB mistake (write) 13: LTB protection violation (read) 14: LTB protection violation (write) 15: Initial page write	–
	Not lit	Not lit	Blinking	Blinking	Lit	No. of blinks for hardware errors: 2: RAM diagnosis error 3: ROM diagnosis error 4: CPU function diagnosis error 5: FPU function diagnosis error	A hardware error has occurred. Replace the Module.
Warning	Undefined	Undefined	Undefined	Undefined	Not lit	Battery alarm	Replace the battery. (Refer to *Chapter 7 Maintenance and Inspection*.)
	Lit	Lit	Lit	Not lit	Not lit	Operation error	Refer to *(3) Ladder Program User Operation Error Status* in *8.2.4 System Register Configuration*.
	Lit	Lit	Lit	Not lit	Not lit	I/O error	Refer to *(5) System I/O Error Status* in *8.2.4 System Register Configuration*

8.2 System Errors

This section explains system error details and remedies.

8.2.1 Overview of System Errors

Indicators on the front panel of the CPU Module indicate the operating and error status of the MP2200. Use the system (S) registers to get for more details on errors. Carefully check system register details to figure out the failure location and implement corrections. The following sections describes the system register in more detail.

(1) System Register Allocation

The following illustration shows the configuration of the system registers.

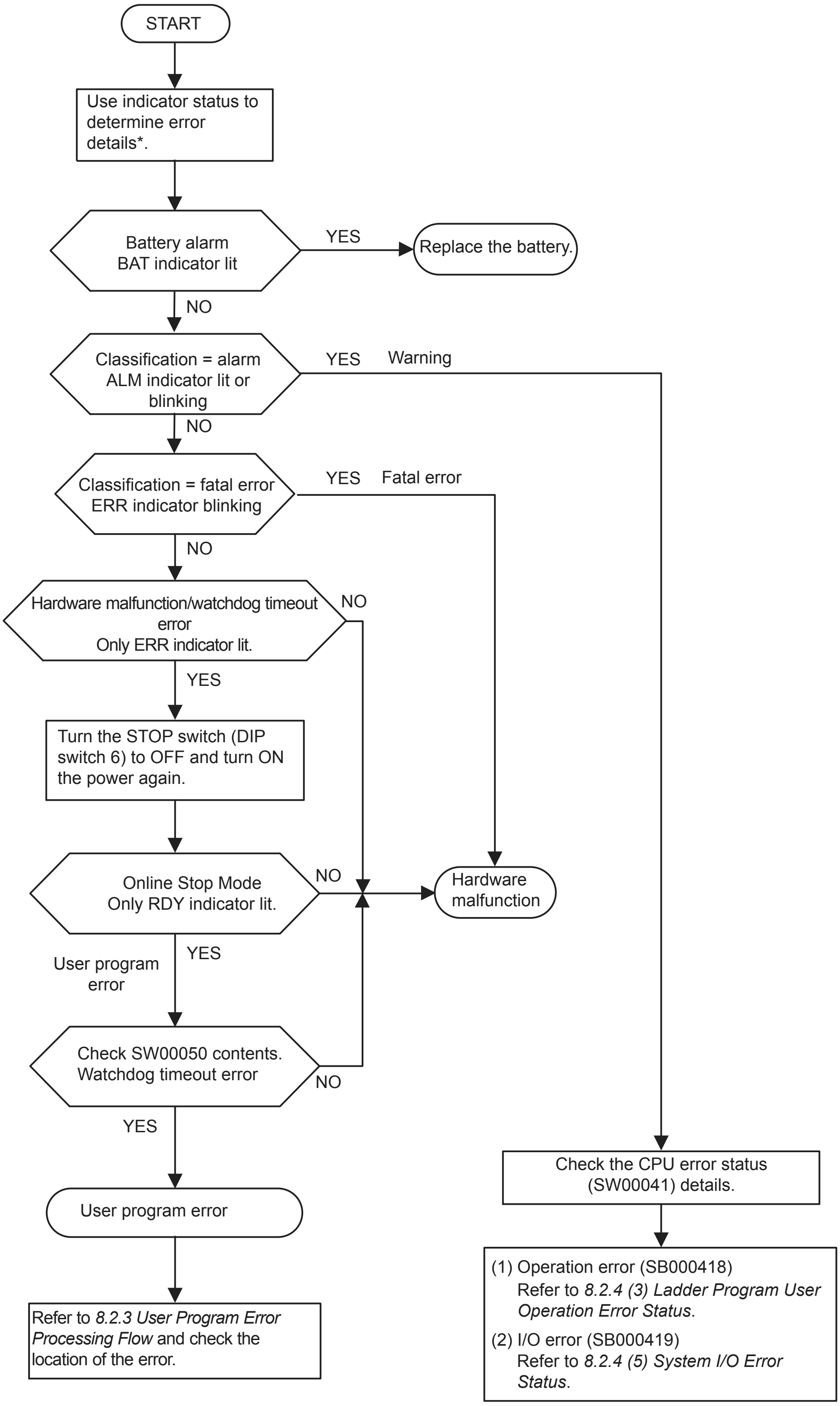
SW00000	System Service Register
SW00030	System Status
SW00050	System Error Status
SW00080	User Operation Error Status
SW00090	System Service Execution Status
SW00110	User Operation Error Status, Details
SW00190	Alarm Counter and Alarm Clear
SW00200	System I/O Error Status
SW00500	Reserved by the system.
SW00698	Interrupt Status
SW00800	Module Information
SW01312	Reserved by the system.
SW02048	Reserved by the system.
SW03200	Motion Program Information
SW05200	Reserved by the system.
SW05264 to SW08191	Reserved by the system.

(2) Viewing System Registers

Use the Quick Reference function or the Register List function from the MPE720.

8.2.2 Processing Flow When a System Error Occurs

The following illustration shows the processing flow when a system error occurs.



* Refer to *(2) Indicator Details* in *8.1.3 Indicator Errors* for details on the meaning of indicators.

8.2.3 Processing Flow for a User Program Error

(1) Processing Flow for a Ladder Program Error

A serious failure has occurred if the ALM and ERR indicators on the front panel of the CPU Module are lit. Place the MP2200 in Stop Status (turn ON DIP switch pin 6) and investigate the problem.

Use the following procedures to check the error.

When ERR Indicator Lit	① Check by Type of Serious Failure	Check the contents of SW00050 (Error Type) to determine if the error is a system error or a user program error.
When ERR Indicator Lit	② Check by Type of Error Program	Check the contents of SW00055 (Program Type) to determine if the error occurred in a drawing or in a function.
When ERR Indicator Lit	③ Check by Error Drawing	Check the contents of SW00054 (Error Task) and SW00056 (Drawing No.) to find the error drawing.
When ERR Indicator Lit	④ Check by Error Function	The error occurred in a function if SW00056 (Drawing No.) reads 0100H. Check the contents of SW00057 (Error Task) and SW00058 (Drawing No.) to find the error drawing. Check SW00059 (Function Referencing Drawing Step No.) for the STEP number where an operation error occurred.
When ALM Indicator Lit	⑤ Check Whether an Operation Error Occurred	Check the error count of all drawings at SW00080 to SW00088. Operation errors are occurring if the count is going up.
When ALM Indicator Lit	⑥ Check the Details and Location of Operation Errors If an operation error occurs, the □00 (H00, L00, i00, and A00) drawings will execute. These drawings can also be used to correct or confirm operation.	1. Check Error Details Check error codes for drawings where the error count is going up. DWG.A: SW00111 DWG.H: SW00143 DWG.I: SW00127 DWG.L: SW00175 2. Check the DWG Number Check the error DWG number for the DWG number where an error occurred. DWG.A: SW00122 DWG.H: SW00154 DWG.I: SW00138 DWG.L: SW00186 3. Check the Function Referencing DWG Number and Function Referencing STEP Number if an error occurred in a function. DWG.A: SW00123, 4 DWG.H: SW00155, 6 DWG.I: SW00139, 40 DWG.L: SW00187, 8
When ALM Indicator Lit	⑦ Correct the Program.	Correct the program at the point where the error occurred.

8

8.2.4 System Register Configuration

(1) System Status

System status indicates the operating status and error details for the system. System status details are used to determine whether hardware or software is the cause of an error.

Name	Register Number	Description		
Reserved by the system.	SW00030 to SW00039	–		
CPU Status	SW00040	SB000400	READY	0: Failure 1: Normal
		SB000401	RUN	0: Stopped, 1: Running
		SB000402	ALARM	0: Normal, 1: Alarm
		SB000403	ERROR	0: Normal, 1: Error
		SB000404	Reserved by the system.	–
		SB000405	Reserved by the system.	–
		SB000406	FLASH	1: Flash operation
		SB000407	WEN	0: Write-disabled, 1: Write-enabled
		SB000408	Reserved by the system.	–
		SB000409	Reserved by the system.	–
		SB00040A SB00040B SB00040C SB00040D	Reserved by the system.	–
		SB00040E	Operation Stop Request	0: RUN, 1: STOP
		SB00040F	Run Switch Status at Power ON	0: STOP 1: RUN
CPU Error Status	SW00041	SB000410	Serious failure	1: WDGE, undefined command See SW00050 for more details.
		SB000411	Reserved by the system.	–
		SB000412	Reserved by the system.	–
		SB000413	Exception Error	–
		SB000414 SB000415 SB000416 SB000417	Reserved by the system.	–
		SB000418	User Operation Error	1: User operation error
		SB000419	I/O error	1: I/O error
		SB00041A	Reserved by the system.	–
		SB00041B	Reserved by the system.	–
		SB00041C to SB00041F	Reserved by the system.	–

(cont'd)

Name	Register Number	Description		
Reserved by the system.	SW00047	SB000470	Reserved by the system.	–
		SB000471 SB000472	Reserved by the system.	–
		SB000473	Reserved by the system.	–
		SB000474	Reserved by the system.	–
		SB000475	Reserved by the system.	–
		SB000476 to SB00047F	Reserved by the system.	–
Hardware Status Configuration	SW00048	SB000480	TEST	DIP switch status 0: ON, 1: OFF
		SB000481	MON	
		SB000482	CNFG	
		SB000483	INIT	
		SB000484	SUP	
		SB000485	STOP	
		SB000486	–	
		SB000487	Battery alarm	–
		SB000488 to SB00048E	Reserved by the system.	–
		SB00048F	Reserved by the system.	–
Reserved by the system.	SW00049	SW000490 to SW00049F	Reserved by the system.	–

(2) System Error Status

The following table lists data when a system error occurs.

Name	Register Number	Description	
32-bit Error Code	SW00050	0001H	Watchdog timeout error
		0041H	ROM diagnosis error
		0042H	RAM diagnosis error
		0043H	CPU diagnosis error
		0044H	FPU diagnosis error
		00E0H	Address error (read)
		0100H	Address error (write)
		0120H	FPU error
		0180H	Illegal general command error
		01A0H	Illegal slot command error
		01E0H	User break after command execution
		0800H	General FPU inhibited error
		0820H	Slot FPU inhibited error
	SW00051	For system error analysis	
32-bit Addresses Generating Error	SW00052 SW00053	For system error analysis	
Ladder Program Error Task	SW00054	0000H: System 0001H: DWG.A 0002H: DWG.I	0003H: DWG.H 0005H: DWG.L
Ladder Program Type	SW00055	0000H: System 0001H: DWG.A 0002H: DWG.I 0003H: DWG.H	0005H: DWG.L 0008H: Function
Ladder Program Error Drawing No.	SW00056	Ladder program parent drawing: FFFFH Ladder program function: 8000H Ladder program child drawing: □□00H (H□□: Child drawing No.) Ladder program grandchild drawing: □□yyH (Hyy: Grandchild drawing No.)	
Ladder Program Function Calling DWG Type	SW00057	Type of drawing that calls the ladder program function in which an error occurred. 0001H: DWG.A 0002H: DWG.I 0003H: DWG.H 0005H: DWG.L	0008H: Ladder program function 0010H: Reserved by the system. 0011H: Reserved by the system.
Ladder Program Function Calling DWG No.	SW00058	Number of drawing that calls the ladder program function in which an error occurred. Parent Drawings: FFFFH Functions: 0100H Child drawing: □□00H (H□□: Child drawing No.) Grandchild drawing: □□yyH (Hyy: Grandchild drawing No.)	
Ladder Program Function Calling DWG No.	SW00059	STEP number of drawing that calls the ladder program function in which an error occurred. 0 when there is an error in the drawing.	

(cont'd)

Name	Register Number	Description
Error Data	SW00060	Reserved by the system.
	SW00061	Reserved by the system.
	SW00062	Name of task generating error
	SW00063	Name of task generating error
	SW00064	Name of task generating error
	SW00065	Name of task generating error
	SW00066	Reserved by the system.
	SW00067	Reserved by the system.
	SW00068	Year generated
	SW00069	Month generated
	SW00070	Day of week generated
	SW00071	Day of month generated
	SW00072	Hour generated
	SW00073	Minutes generated
	SW00074	Seconds generated
	SW00075	Milliseconds generated (Not used.)
	SW00076 to SW00079	Reserved by the system.

(3) Ladder Program User Operation Error Status

The following tables list data available when a user operation error occurs in a ladder program.

Table 8.1 Ladder Program User Operation Error Status 1

<table>
<tr><th>Name</th><th>Register Number</th><th>Description</th></tr>
<tr><td rowspan="2">DWG.A Error Count
Count Error Code</td><td>SW00080</td><td rowspan="10">Operation error code:
See Table 8.3.

Error code when an index error occurs:
SeeTable 8.4.</td></tr>
<tr><td>SW00081</td></tr>
<tr><td rowspan="2">DWG.I Error Count
Count Error Code</td><td>SW00082</td></tr>
<tr><td>SW00083</td></tr>
<tr><td rowspan="2">DWG.H Error Count
Count Error Code</td><td>SW00084</td></tr>
<tr><td>SW00085</td></tr>
<tr><td rowspan="2">Reserved by the system.</td><td>SW00086</td></tr>
<tr><td>SW00087</td></tr>
<tr><td rowspan="2">DWG.L Error Count
Count Error Code</td><td>SW00088</td></tr>
<tr><td>SW00089</td></tr>
</table>

Table 8.2 Ladder Program User Operation Error Status 2

<table>
<tr><th rowspan="2">Name</th><th colspan="4">Register Number</th><th rowspan="2">Remarks</th></tr>
<tr><th>DWG.A</th><th>DWG.I</th><th>DWG.H</th><th>DWG.L</th></tr>
<tr><td>Error Count</td><td>SW00110</td><td>SW00126</td><td>SW00142</td><td>SW00174</td><td rowspan="10">Error DWG number
Parent Drawings: FFFFH
Child drawing: □□00H (H□□: Child drawing No.)
Grandchild drawing: □□yyH (Hyy: Child drawing No.)
Functions: 0100H</td></tr>
<tr><td>Error Code</td><td>SW00111</td><td>SW00127</td><td>SW00143</td><td>SW00175</td></tr>
<tr><td rowspan="2">Error A Register</td><td>SW00112</td><td>SW00128</td><td>SW00144</td><td>SW00176</td></tr>
<tr><td>SW00113</td><td>SW00129</td><td>SW00145</td><td>SW00177</td></tr>
<tr><td rowspan="2">Modification A Register</td><td>SW00114</td><td>SW00130</td><td>SW00146</td><td>SW00178</td></tr>
<tr><td>SW00115</td><td>SW00131</td><td>SW00147</td><td>SW00179</td></tr>
<tr><td rowspan="2">Error F Register</td><td>SW00116</td><td>SW00132</td><td>SW00148</td><td>SW00180</td></tr>
<tr><td>SW00117</td><td>SW00133</td><td>SW00149</td><td>SW00181</td></tr>
<tr><td rowspan="2">Modification F Register</td><td>SW00118</td><td>SW00134</td><td>SW00150</td><td>SW00182</td></tr>
<tr><td>SW00119</td><td>SW00135</td><td>SW00151</td><td>SW00183</td></tr>
<tr><td rowspan="2">Address Generating Error</td><td>SW00120</td><td>SW00136</td><td>SW00152</td><td>SW00184</td><td rowspan="4">Function Calling DWG Number
Number of the drawing that calls the function in which an error occurred.</td></tr>
<tr><td>SW00121</td><td>SW00137</td><td>SW00153</td><td>SW00185</td></tr>
<tr><td>Error DWG Number</td><td>SW00122</td><td>SW00138</td><td>SW00154</td><td>SW00186</td></tr>
<tr><td>Function Calling DWG Number</td><td>SW00123</td><td>SW00139</td><td>SW00155</td><td>SW00187</td></tr>
<tr><td>Function Calling DWG Step Number</td><td>SW00124</td><td>SW00140</td><td>SW00156</td><td>SW00188</td><td rowspan="2">Function Calling DWG Step Number
Step number of the drawing that calls the function in which an error occurred.
0 when there is an error in the drawing.</td></tr>
<tr><td>Reserved by the system.</td><td>SW00125</td><td>SW00141</td><td>SW00157</td><td>SW00189</td></tr>
</table>

Table 8.3 Ladder Program User Operation Error Status -3

	Error Code	Error Contents	User*	System Default
Integer Operation	0001H	Integer operation - underflow	Yes	–32768 [–32768]
	0002H	Integer operation - overflow	Yes	32767 [32767]
	0003H	Integer operation - division error	Yes	The A register remains the same.
	0009H	Double-length integer operation - underflow	Yes	–2147483648 [–2147483648]
	000AH	Double-length integer operation - overflow	Yes	2147483647 [2147483647]
	000BH	Double-length integer operation - division error	Yes	The A register remains the same.
	010□H	Operation error drawing - integer operation error (□ = 1 to B)	No	Default indicated above.
Real Number Operation	0010H	Integer storage - non-numeric error	Yes	Store not executed. [00000]
	0011H	Integer storage - underflow	Yes	Store not executed. [–32768]
	0012H	Integer storage - overflow	Yes	Store not executed. [+32767]
	0021H	Real number storage - underflow	Yes	Store not executed. [–1.0E+38]
	0022H	Real number storage - overflow	Yes	Store not executed. [1.0E+38]
	0023H	Real number operation - division-by-zero error	Yes	Operation not executed. The F register remains the same.
	0030H	Real number operation - invalid operation (non-numeric)	No	Operation not executed.
	0031H	Real number operation - exponent underflow	No	0.0
	0032H	Real number operation - exponent overflow	No	Maximum value
	0033H	Real number operation - division error (non-numeric 0/0)	No	Operation not executed.
	0034H	Real number storage - exponent underflow	No	Stores 0.0.
	0035H	Real number operation - stack error	–	–
	0040H to 0059H	Standard System Functions Real number operation errors	No	Interrupt operation and output = 0.0

Function codes, error codes 0040H to 0059H (Real Number Operation):

0040H: SQRT	0041H: SIN	0042H: COS	0043H: TAN
0044H: ASIN	0045H: ACOS	0046H: ATAN	0047H: EXP
0048H: LN	0049H: LOG	004AH: DZA	004BH: DZB
004CH: LIM	004DH: PI	004EH: PD	004FH: PID
0050H: LAG	0051H: LLAG	0053H: FGN	0054H: IFGN
0054H: LAU	0055H: SLAU	0056H: REM	0057H: RCHK
0058H: BSRCH	0059H: SQRT	–	–

1000H or 2000H is added for an index error.

* Yes: Can be set to value other than system default from the user program.
No: The system default cannot be changed from the user program.

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Table 8.4 Ladder Program User Operation Error Status 4

<table>
<tr><th></th><th>Error Code</th><th colspan="2">Error Contents</th><th>User</th><th colspan="2">System Default</th></tr>
<tr><td rowspan="2">Integer - Real Number Operations</td><td>1000H</td><td colspan="2">Index error within drawing</td><td>No</td><td colspan="2">Execute again with i,j = 0.</td></tr>
<tr><td>2000H</td><td colspan="2">Index error within function</td><td>No</td><td colspan="2">Execute again with i,j = 0.</td></tr>
<tr><td rowspan="4">Integer Operation</td><td rowspan="4">x060H to x077H (x=1,2)</td><td colspan="2">Integer system functions
Index error</td><td>No</td><td colspan="2">Operation stopped and output = input. The A register remains the same.</td></tr>
<tr><td>x06DH: PI</td><td>x06DH: PD</td><td colspan="2">x06FH: PID</td><td colspan="2">x070H: LAG</td></tr>
<tr><td>x071H: LLAG</td><td>x072H: FGN</td><td colspan="2">x073H: IFGN</td><td colspan="2">x074H: LAU</td></tr>
<tr><td>x075H: SLAU</td><td>x076H: FGN</td><td colspan="2">x077H: IFGN</td><td colspan="2">–</td></tr>
</table>

(4) System Service Execution Status

Name	Register Number	Remarks
Reserved by the system.	SW00090	–
Reserved by the system.	SW00091	
Reserved by the system.	SW00092	
Reserved by the system.	SW00093	
Reserved by the system.	SW00094 to SW00097	–
Existence Of Data Trace Definition	SW00098	Bit 0 to 3 = Group 1 to 4 Definition exists = 1, No definition = 0
Data Trace Execution Status	SW00099	Bit 0 to 3 = Group 1 to 4 Trace stopped = 1, Trace executing = 0

Table 8.5 Latest Data Trace Record Number

Name	Register Number	Remarks
Data Trace Group 1	SW00100	Latest record number
Data Trace Group 2	SW00101	Latest record number
Data Trace Group 3	SW00102	Latest record number
Data Trace Group 4	SW00103	Latest record number

(5) System I/O Error Status

Name	Register Number	Remarks
Current Alarm	SW00190	Cleared when power is turned ON.
Number of Alarm History Records	SW00191	The number of alarms in the alarm history.
Clear Alarm	SW00192	1: Clear alarms 2: Clear current alarm and alarm history
I/O Error Count	SW00200	Number of I/O errors
Input Error Count	SW00201	Number of input errors
Input Error Address	SW00202	Latest input error address (OW□□□□ register number)
Output Error Count	SW00203	Output Error Count
Number of Output Errors	SW00204	Latest output error address (OW□□□□ register number)
Reserved by the system.	SW00205	Not used
	SW00206	
	SW00207	
I/O Error Status	SW00208 to SW00215	Slot 0 error status
	SW00216 to SW00223	Reserved by the system.
	SW00224 to SW00231	Slot 1 error status
	SW00232 to SW00239	Slot 2 error status
	SW00240 to SW00247	Slot 3 error status
	SW00248 to SW00255	Reserved by system. (Slot 4 error status)
	···	
	SW00456 to SW00463	Reserved by system. (Slot 30 error status)

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(6) Actions to be Taken when a Transmission Error Occurs

When a transmission error occurs during system I/O, the error status is reported in the system register as shown below.

(a) System I/O Error Status

Name	Register Number	Remarks
CPU-01	SW00208 to SW00215	Not used. (Not used because the CPU-01 Module does not have a built-in I/O Module or Communication Module.)
Reserved by the system.	SW00216 to SW00223	Not used.
Rack 1, Slot 1 Information	SW00224 to SW00231	Differs depending on the Module mounted and the error code.
Rack 1, Slot 2 Information	SW00232 to SW00239	Same as above.
Rack 1, Slot 3 Information	SW00240 to SW00247	Same as above.
Rack 1, Slot 4 Information	SW00248 to SW00255	Same as above.
Rack 1, Slot 5 Information	SW00256 to SW00263	Same as above.
Rack 1, Slot 6 Information	SW00264 to SW00271	Same as above.
Rack 1, Slot 7 Information	SW00272 to SW00279	Same as above.
Rack 1, Slot 8 Information	SW00280 to SW00287	Same as above.
Rack 2, Slot 1 Information	SW00288 to SW00295	Same as above.
Rack 2, Slot 2 Information	SW00296 to SW00303	Same as above.
Rack 2, Slot 3 Information	SW00304 to SW00311	Same as above.
Rack 2, Slot 4 Information	SW00312 to SW00319	Same as above.
Rack 2, Slot 5 Information	SW00320 to SW00327	Same as above.
Rack 2, Slot 6 Information	SW00328 to SW00335	Same as above.
Rack 2, Slot 7 Information	SW00336 to SW00343	Same as above.
Rack 2, Slot 8 Information	SW00344 to SW00351	Same as above.
Rack 2, Slot 9 Information	SW00352 to SW00359	Same as above.
Rack 3, Slot 1 Information	SW00360 to SW00367	Same as above.
Rack 3, Slot 2 Information	SW00368 to SW00375	Same as above.
Rack 3, Slot 3 Information	SW00376 to SW00383	Same as above.
Rack 3, Slot 4 Information	SW00384 to SW00391	Same as above.
Rack 3, Slot 5 Information	SW00392 to SW00399	Same as above.
Rack 3, Slot 6 Information	SW00400 to SW00407	Same as above.
Rack 3, Slot 7 Information	SW00408 to SW00415	Same as above.
Rack 3, Slot 8 Information	SW00416 to SW00423	Same as above.
Rack 3, Slot 9 Information	SW00424 to SW00431	Same as above.
Rack 4, Slot 1 Information	SW00432 to SW00439	Same as above.
Rack 4, Slot 2 Information	SW00440 to SW00447	Same as above.
Rack 4, Slot 3 Information	SW00448 to SW00455	Same as above.
Rack 4, Slot 4 Information	SW00456 to SW00463	Same as above.
Rack 4, Slot 5 Information	SW00464 to SW00471	Same as above.
Rack 4, Slot 6 Information	SW00472 to SW00479	Same as above.
Rack 4, Slot 7 Information	SW00480 to SW00487	Same as above.
Rack 4, Slot 8 Information	SW00488 to SW00495	Same as above.
Rack 4, Slot 9 Information	SW00496 to SW00503	Same as above.

(b) I/O Error Status, Applicable Modules

Classification	Abbreviation	Applicable	Remarks
CPU Module	CPU-01	No	No external I/O interface
Motion Modules	SVA-01	No	Refer to the monitor parameters for error information.
	SVB-01	Yes	
Communication Modules	217IF-01	No	No I/O
	218IF-01	No	No I/O
	260IF-01	Yes	
	261IF-01	Yes	
I/O Modules	LIO-01	Yes	
	LIO-02	Yes	
	LIO-04	Yes	
Expansion I/O Modules	EXIOIF	No	

- SVB-01 Module Error Status

Example: Rack 1, Slot 1

	F–8	7–0 (Bit No.)
SW00224	Status	Subslot (function) No.[1]

	F		2	1	0 (Bit No.)
SW00225	ST#15	················	ST#2	ST#1	Not used.

	F	E	D			
SW00226	Not used.	ST#30	ST#29	················	ST#17	ST#16

SW00227	Not used.
SW00228	Not used.
SW00229	Not used.
SW00230	Not used.
SW00231	Not used.

Table 8.6 Error Status Details

Item	Code	Remarks
Subslot No.	1	1 = SVB-01 (MECHATROLINK communications)
Status	0	Normal
	1	Station error
ST#n	0	Communication normal
	1	Communication error at "n" station (When set to slave, n is the local station number.)

TERMS

Subslot No.

The number displayed in the Module Details section in the Module Definition Window.

• 260IF-01 Module Error Status

Example: Rack 1, Slot 1

	F … 8	7 … 0 (Bit No.)
SW00224	Status	Subslot (function) No.

	F		2	1	0 (Bit No.)
SW00225	ST#15	....	ST#2	ST#1	ST#0

	F	E D		
SW00226	ST#31	....	ST#17	ST#16
SW00227	ST#47	....	ST#33	ST#32
SW00228	ST#63	....	ST#49	ST#48
SW00229	Not used.			
SW00230	Not used.			
SW00231	Not used.			

Table 8.7 Error Status Details

Item	Code	Remarks
Subslot No.	2	2 = 260IF (DeviceNet) Note: 1 = 217IF (RS-232C)
Status	0	Normal
	1	Station error
ST#n	0	Communications normal
	1	Communication error at "n" station (When set to slave, n is the local station number.)

- 261IF-01 Module Error Status

Example: Rack 1, Slot 1

	F 8	7 0	(Bit No.)
SW00224	Status	Subslot (function) No.	

	F		2	1	0	(Bit No.)
SW00225	ST#15	················	ST#2	ST#1	ST#0	
	F	E D				
SW00226	ST#31	················		ST#17	ST#16	
SW00227	ST#47	················		ST#33	ST#32	
SW00228	ST#63	················		ST#49	ST#48	
SW00229	Not used.					
SW00230	Not used.					
SW00231	Not used.					

Table 8.8 Error Status Details

Item	Code	Remarks
Subslot No.	2	2 = 261IF (Profibus slave) Note: 1 = 217IF (RS-232C)
Status	0	Normal
	1	Station error
ST#n	0	Communication normal
	1	Communication error at "n" station (When set to slave, n is the local station number.)

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• LIO-01 Module Error Status

Example: Rack 1, Slot 1

	F 8	7 0 (Bit No.)
SW00224	Status	Subslot (function)No.
SW00225	Not used.	
SW00226	Not used.	
SW00227	Not used.	
SW00228	Not used.	
SW00229	Not used.	
SW00230	Not used.	
SW00231	Not used.	

Table 8.9 Error Status Details

Item	Code	Remarks
Subslot No.	1	1 = LIO (DI: 16 points, DO: 16 points (sink mode)) Note: 2 = CNTR* (counter)
Status	0	Normal
	2	I/O error (Output fuse burnout)

* CNTR error information (PG burnout) is reflected in the input registers.

- LIO-02 Module Error Status

Example: Rack 1, Slot 1

	F 8	7 0 (Bit No.)
SW00224	Status	Subslot (function) No.
SW00225	Not used.	
SW00226	Not used.	
SW00227	Not used.	
SW00228	Not used.	
SW00229	Not used.	
SW00230	Not used.	
SW00231	Not used.	

Table 8.10 Error Status Details

Item	Code	Remarks
Subslot No.	1	1 = LIO (DI: 16 points, DO: 16 points (source mode)) Note: 2 = CNTR* (counter)
Status	0	Normal
	2	I/O error (Output fuse burnout)

* CNTR error information (PG burnout) is reflected in the input registers.

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- LIO-04 Module Error Status

Example: Rack 1, Slot 1

	F 8	7 0 (Bit No.)
SW00224	Status	Subslot (function) No.
SW00225	Not used.	
SW00226	Not used.	
SW00227	Not used.	
SW00228	Not used.	
SW00229	Not used.	
SW00230	Not used.	
SW00231	Not used.	

Table 8.11 Error Status Details

Item	Code	Remarks
Subslot No.	1	1 = LIO (DI: 32 points, DO: 32 points (sink mode))
Status	0	Normal
	2	I/O error (Output fuse burnout)

(7) Interrupt Status

(a) Interrupt Status

Name	Register Number	Remarks
Interrupt Detection Counter	SW00698	
Module Generating Interrupt	SW00699	Number of Interrupt Modules for one time
Interrupt Module	SW00700	Interrupt Module 1
	SW00701	
	SW00702	
	SW00703	Interrupt Module 2
	SW00704	
	SW00705	
	:	
	:	
	SW00787	Interrupt Module 30
	SW00788	
	SW00789	

(b) Interrupt Module Details

	F 8	7 0	(Bit No.)
SW00XXX + 0	Rack	Slot	mmssH
SW00XXX + 1	Interrupt Type		
SW00XXX + 2	Hardware Interrupt Factor Register Values		

1. Rack
   mm = 01 to 04
   The rack number where the Module that was the interrupt factor is mounted.
2. Slot
   ss = 01 to 09
   The slot number where the Module that was the interrupt factor is mounted.
3. Interrupt Type
   1: Reserved by the system.
   2: LIO-01/LIO-02/LIO-04 DI interrupts
   3: LIO-01/LIO-02 counter interrupts
4. Hardware Interrupt Factor Register Values
   - Interrupt Type = 2 (LIO-01, LIO-02, and LIO-04 DI Interrupts)

Bit	Meaning
0 to 4	Reserved by the system.
5	LIO-01 and LIO-02 interrupt inputs: 1 = Interrupt input, 0 = No interrupt input
6 to 8	Reserved by the system.
9	LIO-04 interrupt input 1: 1 = Interrupt input, 0 = No interrupt input
10	LIO-04 interrupt input 2: 1 = Interrupt input, 0 = No interrupt input
11	LIO-04 interrupt input 3: 1 = Interrupt input, 0 = No interrupt input
12	LIO-04 interrupt input 4: 1 = Interrupt input, 0 = No interrupt input
13 to 15	Reserved by the system.

   - Interrupt Type = 3 (LIO-01 and LIO-02 Counter Interrupts)

Bit	Meaning
0 to 3	Reserved by the system.
4	Counter Agreement Status: 1 = Counter agreement, 0 = No counter agreement
5 to 15	Reserved by the system.

(8) Module Information

Name	Register Number	Remarks
CPU Information	SW00800	Module ID
	SW00801	CPU Hardware version (BCD)
	SW00802	CPU Software version (BCD)
	SW00803	Number of subslots
	SW00804	CPU Function Module ID
	SW00805	CPU Function Module Status
	SW00806	SVR Function Module ID
	SW00807	SVR Function Module Status
	SW00808 to SW00815	Reserved by the system.
Rack 1, Slot 1 Information	SW00816	Module ID
	SW00817	Hardware version (BCD)
	SW00818	Software version (BCD)
	SW00819	Number of subslots
	SW00820	Subslot 1 Function Module ID
	SW00821	Subslot 1 Function Module Status
	SW00822	Subslot 2 Function Module ID
	SW00823	Subslot 2 Function Module Status
Rack 1, Slot 2 Information	SW00824 to SW00831	Same as above.
Rack 1, Slot 3 Information	SW00832 to SW00839	Same as above.
Rack 1, Slot 4 Information	SW00840 to SW00847	Same as above.
Rack 1, Slot 5 Information	SW00848 to SW00855	Same as above.
Rack 1, Slot 6 Information	SW00856 to SW00863	Same as above.
Rack 1, Slot 7 Information	SW00864 to SW00871	Same as above.
Rack 1, Slot 8 Information	SW00872 to SW00879	Same as above.
Rack 2, Slot 1 Information	SW00880	Module ID
	SW00881	Hardware version (BCD)
	SW00882	Software version (BCD)
	SW00883	Number of subslots
	SW00884	Subslot 1 Function Module ID
	SW00885	Subslot 1 Function Module Status
	SW00886	Subslot 2 Function Module ID
	SW00887	Subslot 2 Function Module Status
Rack 2, Slot 2 Information	SW00888 to SW00895	Same as above.
Rack 2, Slot 3 Information	SW00896 to SW00903	Same as above.
Rack 2, Slot 4 Information	SW00904 to SW00911	Same as above.
Rack 2, Slot 5 Information	SW00912 to SW00919	Same as above.
Rack 2, Slot 6 Information	SW00920 to SW00927	Same as above.
Rack 2, Slot 7 Information	SW00928 to SW00935	Same as above.
Rack 2, Slot 8 Information	SW00936 to SW00943	Same as above.
Rack 2, Slot 9 Information	SW00944 to SW00951	Same as above.
Rack 3, Slot 1 Information	SW00952	Module ID
	SW00953	Hardware version (BCD)
	SW00954	Software version (BCD)
	SW00955	Number of subslots
	SW00956	Subslot 1 Function Module ID
	SW00957	Subslot 1 Function Module Status
	SW00958	Subslot 2 Function Module ID
	SW00959	Subslot 2 Function Module Status

(cont'd)

Name	Register Number	Remarks
Rack 3, Slot 2 Information	SW00960 to SW00967	Same as above.
Rack 3, Slot 3 Information	SW00968 to SW00975	Same as above.
Rack 3, Slot 4 Information	SW00976 to SW00983	Same as above.
Rack 3, Slot 5 Information	SW00984 to SW00991	Same as above.
Rack 3, Slot 6 Information	SW00992 to SW00999	Same as above.
Rack 3, Slot 7 Information	SW01000 to SW01007	Same as above.
Rack 3, Slot 8 Information	SW01008 to SW01015	Same as above.
Rack 3, Slot 9 Information	SW01016 to SW01023	Same as above.
Rack 4, Slot 1 Information	SW01024	Module ID
	SW01025	Hardware version (BCD)
	SW01026	Software version (BCD)
	SW01027	Number of subslots
	SW01028	Subslot 1 Function Module ID
	SW01029	Subslot 1 Function Module Status
	SW01030	Subslot 2 Function Module ID
	SW01031	Subslot 2 Function Module Status
Rack 4, Slot 2 Information	SW01032 to SW01039	Same as above.
Rack 4, Slot 3 Information	SW01040 to SW01047	Same as above.
Rack 4, Slot 4 Information	SW01048 to SW01055	Same as above.
Rack 4, Slot 5 Information	SW01056 to SW01063	Same as above.
Rack 4, Slot 6 Information	SW01064 to SW01071	Same as above.
Rack 4, Slot 7 Information	SW01072 to SW01079	Same as above.
Rack 4, Slot 8 Information	SW01080 to SW01087	Same as above.
Rack 4, Slot 9 Information	SW01088 to SW01095	Same as above.

Appendices

A

A List of System Registers

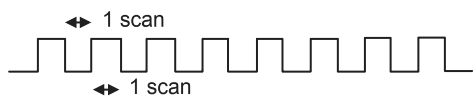
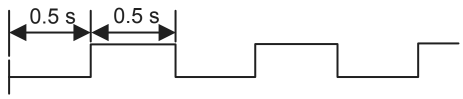
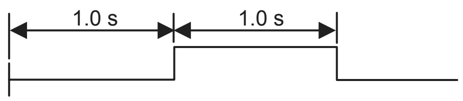
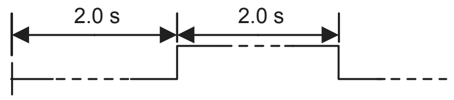
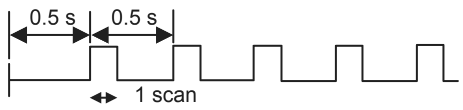
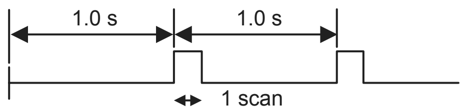
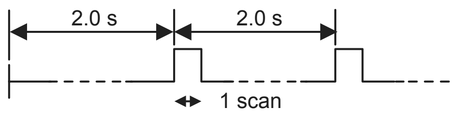
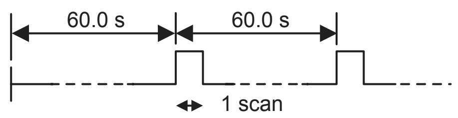
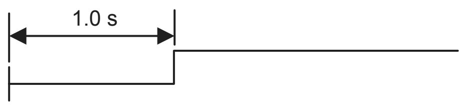
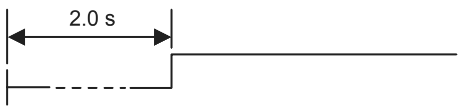
A.1 System Service Registers

(1) Registers Common to All Drawings

Name	Register Number	Remarks
Reserved by the system.	SB000000	Not used
High-speed scan	SB000001	ON for only the first scan after high-speed scan is started.
Low-speed scan	SB000003	ON for only the first scan after low-speed scan is started.
Always ON	SB000004	Always ON. (= 1)
Reserved by the system.	SB000005 to SB00000F	Not used

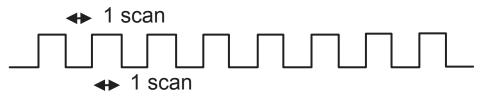
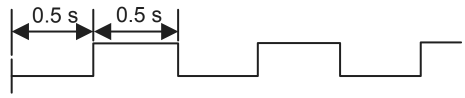
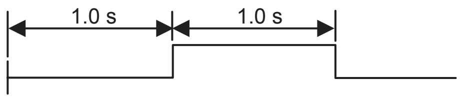
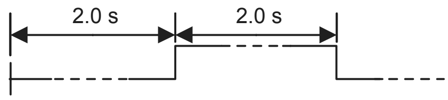
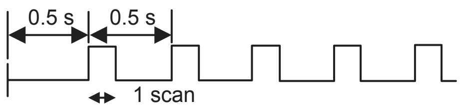
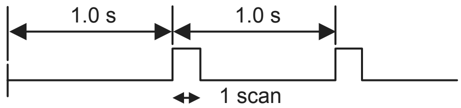
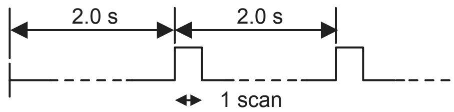
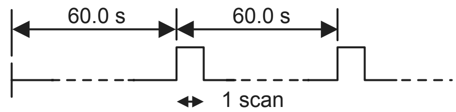
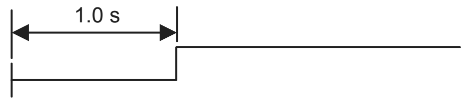
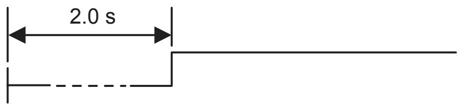
(2) Registers Specific to High-speed Scan Drawings

These registers are set when high-speed scan starts.

Name	Register Number	Remarks
1-scan Flicker Relay	SB000010	
0.5-s Flicker Relay	SB000011	
1.0-s Flicker Relay	SB000012	
2.0-s Flicker Relay	SB000013	
0.5-s Sampling Relay	SB000014	
1.0-s Sampling Relay	SB000015	
2.0-s Sampling Relay	SB000016	
60.0-s Sampling Relay	SB000017	
1.0 s After Start of Scan Relay	SB000018	
2.0 s After Start of Scan Relay	SB000019	
5.0 s After Start of Scan Relay	SB00001A	

(3) Registers Specific to Low-speed Scan Drawings

These registers are set when low-speed scan starts.

Name	Register Number	Remarks
1-scan Flicker Relay	SB000030	
0.5-s Flicker Relay	SB000031	
1.0-s Flicker Relay	SB000032	
2.0-s Flicker Relay	SB000033	
0.5-s Sampling Relay	SB000034	
1.0-s Sampling Relay	SB000035	
2.0-s Sampling Relay	SB000036	
60.0-s Sampling Relay	SB000037	
1.0 s After Start of Scan Relay	SB000038	
2.0 s After Start of Scan Relay	SB000039	
5.0 s After Start of Scan Relay	SB00003A	

A.2 Scan Execution Status and Calendar

Name	Register Number	Remarks
High-speed Scan Set Value	SW00004	High-speed Scan Set Value (0.1 ms)
High-speed Scan Current Value	SW00005	High-speed Scan Current Value (0.1 ms)
High-speed Scan Maximum Value	SW00006	High-speed Scan Maximum Value (0.1 ms)
Reserved by the system.	SW00007 to SW00009	Not used
Low-speed Scan Set Value	SW00010	Low-speed Scan Set Value (0.1 ms)
Low-speed Scan Current Value	SW00011	Low-speed Scan Current Value (0.1 ms)
Low-speed Scan Maximum Value	SW00012	Low-speed Scan Maximum Value (0.1 ms)
Reserved by the system.	SW00013	Not used
Executing Scan Current Value	SW00014	Executing Scan Current Value (0.1 ms)
Calendar: Year	SW00015	1999: 0099 (BCD) (Last two digits only)
Calendar: Month Day	SW00016	December 31: 1231 (BCD)
Calendar: Hours Minutes	SW00017	23 hours 59 minutes: 2359 (BCD)
Calendar: Seconds	SW00018	59 s: 59 (BCD)
Calendar: Day of Week	SW00019	0 to 6: Sun., Mon. to Sat.

A.3 Program Software Numbers and Remaining Program Memory Capacity

Name	Register Number	Remarks
System Program Software Number	SW00020	S□□□□ (□□□□ is stored as BCD)
System Number	SW00021 to SW00025	Not used
Remaining Program Memory Capacity	SW00026	In bytes
Total Module Memory Capacity	SW00028	In bytes

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Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

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Date of printing

Date of original publication

Printing date	Revision Number	Section Number	Revised Contents
September 2004	–		First edition
August 2005	◇1	Back cover	Revision: Address
April 2006	◇2		Based on Japanese user’s manual, SIJPC88070014B<2>-1, available on the Web.
October 2006	◇3		Based on Japanese user’s manual, SIJPC88070014C<4>-0, printed in October 2006.
		4.4	New section added: CPU-02 Module
		2.4.2, 7.2	Revision: Accessory battery model ZZK000064→JZSP-BA01

Machine Controller MP2200
USER'S MANUAL

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Specifications are subject to change without notice
for ongoing product modifications and improvements.

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